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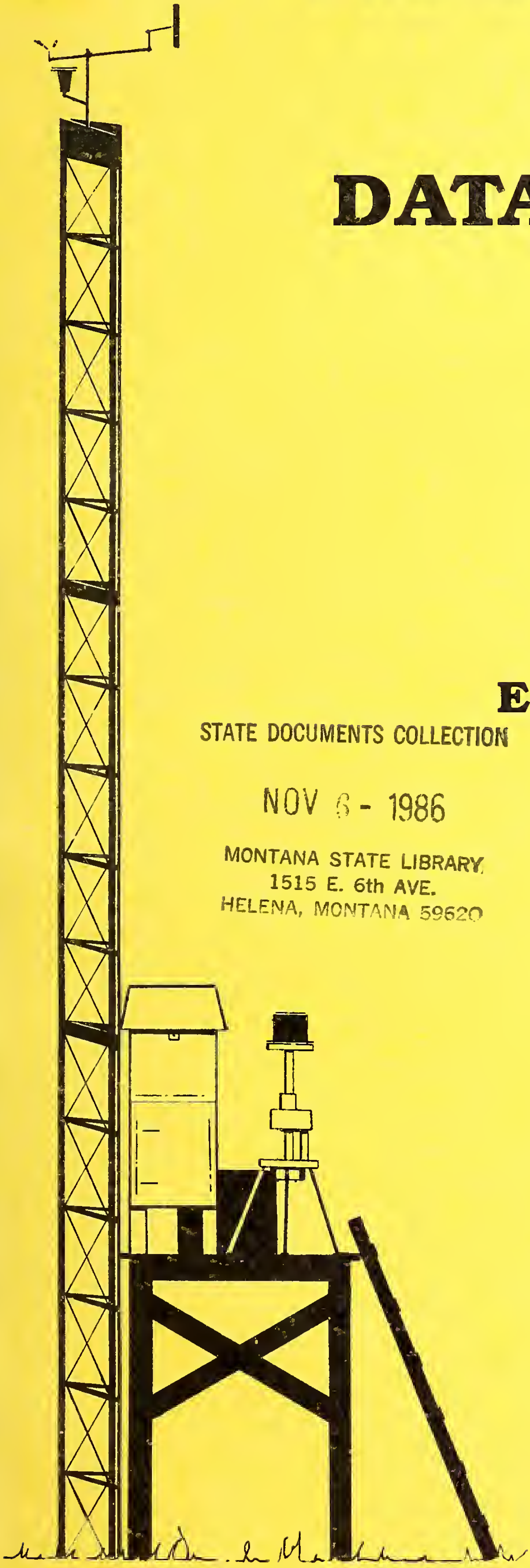

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**Helena, Montana 59620**

**September, 1986**

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# MONTANA AIR QUALITY
# DATA AND INFORMATION
# SUMMARY
# FOR
# 1985

Prepared by:
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Harold Robbins, Chief
Air Quality Bureau
Environmental Sciences Division
Department of Health and Environmental Sciences
Helena, Montana 59620

September 1986

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# INTRODUCTION

# INTRODUCTION

The purpose of the Montana Air Quality Data and Information Summary for 1985 is to summarize air quality data from various regions in the state and to provide information on air quality topics.

The regional summaries provide an overview of monitoring activities in each Air Quality Control Region (AQCR) (See Appendix Q for a state map showing AQCR's). Within each region, various background information is provided. This includes: location of the AQCR, physical features, population, types of pollution sources, monitoring site descriptions, summaries of the air quality data, and the number of data values exceeding the federal and Montana ambient standards.

The air quality data summaries have been tabulated to show the following: site code, site name, year of record, month, number of observations, first, second and third maxima, arithmetic mean, three-hour maximum ($SO_2$), eight-hour maximum (CO), 24-hour maximum ($SO_2$), and geometric mean (TSP).

In AQCR 140 (south central Montana), the major air pollution problem involves $SO_2$ in Billings from a coal-fired power plant and three oil refineries. There was one violation of the federal 3-hour standard, and three sites had violations of the Montana 24-hour standard. There were no violations of the Montana annual SO2 standard due to insufficient data collection.

In AQCR 141 (north central Montana), a minor problem exists with carbon monoxide and particulate matter in Great Falls. There were, violations of the Montana 24-hour and annual standards for TSP at one site but no violations of the CO standards.

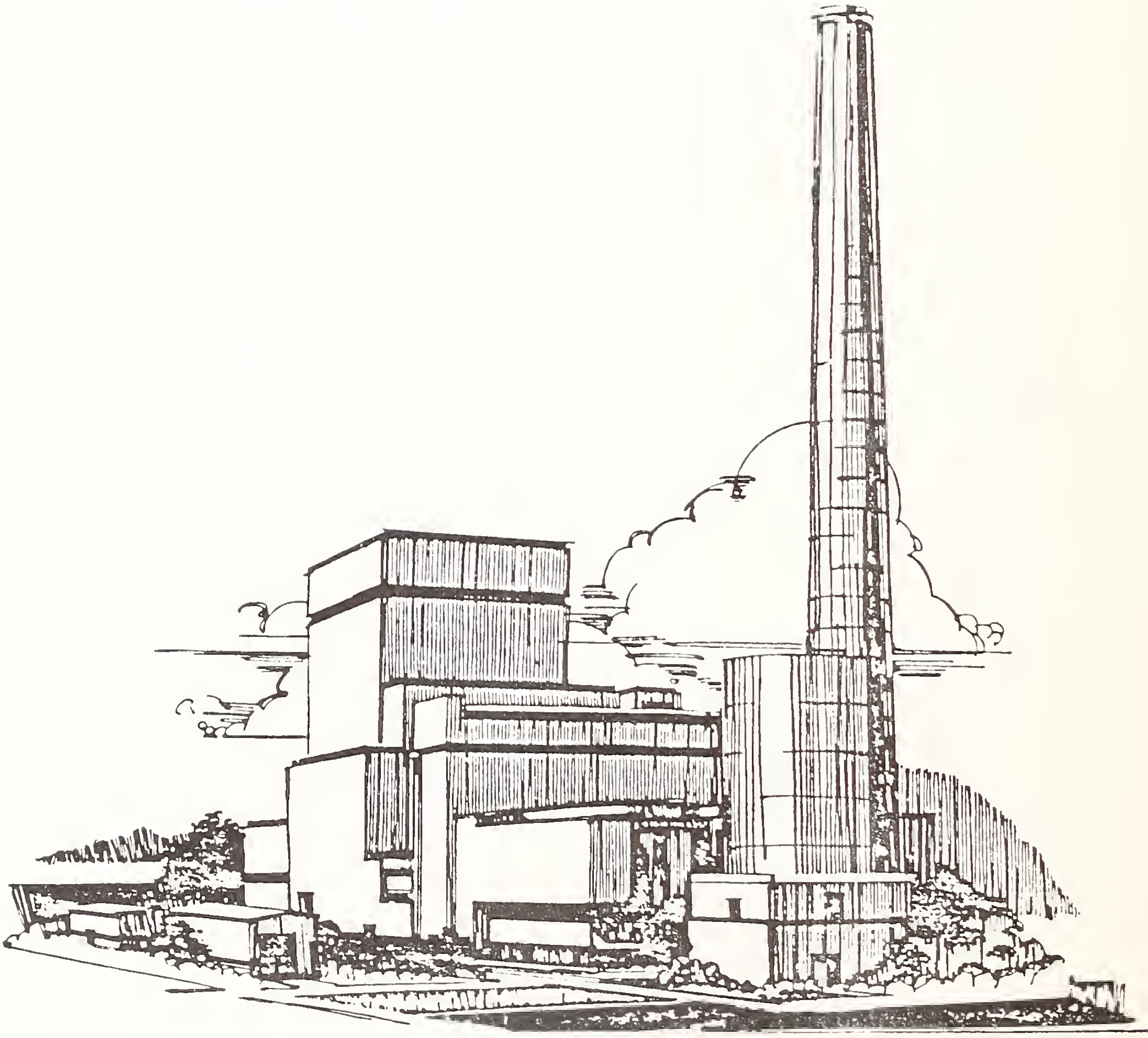
In AQCR 142 (southwest Montana), the major air pollution problems involve particulate matter and lead. One site had a violations of the federal 24-hour TSP standard while four sites had violations of the Montana 24-hour TSP standard. There was one site that violated of the Montana annual TSP standard. Lead concentrations in East Helena were elevated and resulted in thirteen violations of the federal calendar quarter standard. There has been a downward trend in lead concentrations due to control measures instituted at the primary lead smelter.

In AQCR 143 (eastern Montana), there were no violations of any air pollution standards. Sulfur dioxide was a minor problem; sources included coal-fired power plants and oil well flares and vents.

In AQCR 144 (western Montana), the major air pollution problem is particulate matter. There is also some concern with carbon monoxide. There were three sites that violated the federal annual TSP standards and five sites that violated the Montana annual TSP standard. There were eight sites that violated both the federal and Montana 24-hour TSP standards. There were two violations of the eight hour CO standard at the Boyd Park site in Missoula.

In the second half of this report, several appendices are provided on a variety of topics relating to air quality. These include discussions on Prevention of Significant Deterioration, Attainment-Nonattainment Designations, Ambient Air Quality Standards, Smoke Management and Visible Emission Documentation. Other miscellaneous tables, lists and short reports are included for the reader's benefit and informational needs.

This report was compiled for use by the general public. The subject of air quality is often complicated and data intensive. As a consequence, it cannot be covered completely in any one report. The Department hopes that this report will serve the needs of most users. If not, additional information may be requested.



# AQCR 140

# AQCR 140

## INTRODUCTION

This section deals with the air monitoring activities and pollution concerns in AQCR 140.

## LOCATION AND PHYSICAL FEATURES

AQCR 140 is located in southcentral Montana. Physical features include mountainous areas, foothills and sedimentary plains. The Yellowstone and Musselshell Rivers flow from west to east and cut through the region. The Missouri River borders the region on the north. Wyoming borders it on the south. Figure 1 shows a regional map.

## POPULATION

The population of AQCR 140 is 173,500 (1984 estimate) or 21.0 percent of the state population. The majority of the people in this region live in Yellowstone County (Billings and Laurel).

## POLLUTION SOURCES

Pollution sources and types of pollutants are listed for each county in the region. A final category lists the types of sources that would be expected in all counties in the region. The sources by county are as follows:

Big Horn County

Four coal strip mines (particulates)

Carbon County

Calcium manufacturing (particulates)

Fergus County

Gypsum manufacturing (particulates)

Wheatland County

Sawmill (particulates)

Yellowstone County

Three oil refineries ($SO_2$, $H_2S$, NOx, $SO_3$, particulates)

Coal-fired power plant ($SO_2$, NOx, particulates)

Sugar beet refinery ($SO_2$, NOx, particulates)

Sulfur plant ($SO_2$, $SO_3$)

Grain processing (particulates)

All Counties

Asphalt plants (particulates)

Gravel crushers (particulates)

Home heating devices (particulates, CO)

Automobiles (CO, NOx, re-entrained particulates)

Agricultural activities (particulates)

Wind erosion (particulates)

## MONITORING SITE DESCRIPTIONS

A number of monitoring sites were in operation during 1985. Table 1 lists the monitoring site descriptions. This includes site codes, site name, supporting agency, station type, project description, city name and county name.

## DATA SUMMARY

### Total Suspended Particulates

TSP was monitored at six sites in this region in 1985. Two of the sites were collocated. The maximum 24-hour observation was 315 ug/$m^3$ at the Taft School site in Billings. The highest annual geometric average was 62.6 ug/$m^3$ at the Taft School site and the next highest was 55.8 at the City Hall site. Table 2 summarizes the TSP data for this region and Table 3 shows the number of exceedances of the federal and Montana standards.

### Carbon Monoxide

Carbon monoxide was monitored at one location (Metra-Fairgrounds) in this region. The maximum one hour observation was 10.5 ppm. The maximum eight hour observation was 4.5 ppm. There were no violations of the CO standards. Table 4 summarizes the CO data at the Metra site and Table 5 shows the number of exceedances.

### Sulfur Dioxide

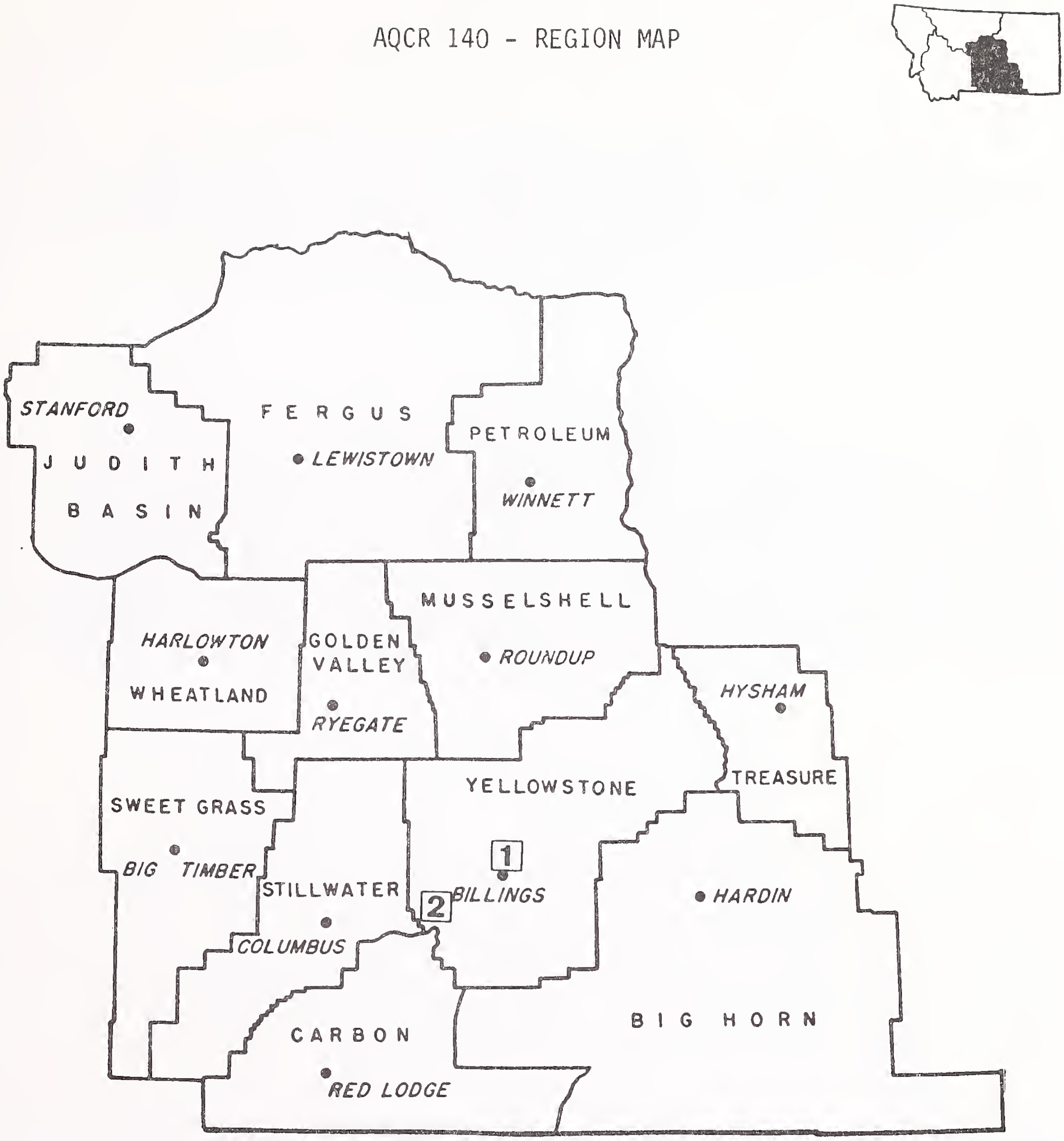
Sulfur dioxide was monitored at three sites in Billings in 1985. The maximum one hour reading was .996 ppm at the Coburn Road site. The maximum three hour average was .845 ppm at Coburn Road. The maximum twenty-four average was .202 ppm at the Coburn Road site. The highest annual average in the area was .024 ppm at the Lockwood Park site. There was one violation of the Federal 3-hour standard, and all three sites had violations of the Montana 24-hour standard. There were no violations of the annual standards because the minimum number of valid hours (400) was not monitored in each of the 12 calendar months. Table 6 summarizes the $SO_2$ data for this region while Table 7 shows the number of exceedances.

## Sulfation Rate

Sulfation Rate was monitored at 36 sites in Yellowstone County. The highest monthly observation was 1.89 mg $SO_3/cm^2/day$ at the Coburn Road site. The highest annual average was 1.06 mg $SO_3/cm^2/day$ also at the Coburn Road site. There is no standard for sulfation rate; readings greater than .5 mg $SO_3/cm^2/day$ indicate possible trouble spots and warrant continued sampling. Table 8 summarizes the sulfation rate data.

FIGURE 1

AQCR 140 - REGION MAP


STANFORD
JUDITH BASIN
FERGUS
LEWISTOWN
PETROLEUM
WINNETT
MUSSELSHELL
ROUNDUP
HARLOWTON
WHEATLAND
GOLDEN VALLEY
RYEGATE
HYSHAM
TREASURE
YELLOWSTONE
SWEET GRASS
BIG TIMBER
STILLWATER
COLUMBUS
1
2
BILLINGS
HARDIN
BIG HORN
CARBON
RED LODGE

MONITORING SITE LOCATIONS

1. Billings
2. Laurel

TABLE 1a
AQCR 140 - MONITORING SITE DESCRIPTIONS

| AREA/SITE CODE | SITE NAME/ADDRESS<br>SUPPORTING AGENCY | STATION TYPE<br>PROJECT DESCRIPTION | CITY<br>COUNTY |
|---|---|---|---|
| 0080 001 G 02 | 214 PUEBLO STREET<br>YELLOWSTONE COUNTY AIR POLLUTION CONTROL | SUBURBAN-RESIDENTIAL<br>SOURCE ORIENTED | BILLINGS<br>YELLOWSTONE |
| 0080 003 G 02 | 113 BITTERROOT DRIVE<br>YELLOWSTONE COUNTY AIR POLLUTION CONTROL | RURAL-NEAR URBAN<br>SOURCE ORIENTED | BILLINGS<br>YELLOWSTONE |
| 0080 004 G 02 | 114 JOHNSON LANE<br>YELLOWSTONE COUNTY AIR POLLUTION CONTROL | RURAL-AGRICULTURAL<br>SOURCE ORIENTED | BILLINGS<br>YELLOWSTONE |
| 0080 006 G 02 | LOCKWOOD SCHOOL<br>YELLOWSTONE COUNTY AIR POLLUTION CONTROL | SUBURBAN-INDUSTRIAL<br>SOURCE ORIENTED | BILLINGS<br>YELLOWSTONE |
| 0080 007 G 01 | KGHL STATION, WEST OF BILLINGS ON HWY 10<br>YELLOWSTONE COUNTY AIR POLLUTION CONTROL | RURAL-AGRICULTURAL<br>POPULATION ORIENTED | BILLINGS<br>YELLOWSTONE |
| 0080 005 G 01 | CITY HALL, 3RD AVE NORTH & 27TH STREET<br>YELLOWSTONE COUNTY AIR POLLUTION CONTROL | CITY CENTER-COMMERCIAL<br>POPULATION ORIENTED | BILLINGS<br>YELLOWSTONE |
| 0080 008 G 07 | CITY HALL COLOCATED HIVOL<br>YELLOWSTONE COUNTY AIR POLLUTION CONTROL | CITY CENTER-COMMERCIAL<br>QA-COLOCATED SAMPLER | BILLINGS<br>YELLOWSTONE |
| 0080 009 G 01 | GRAND AVENUE SCHOOL, 1320 GRAND AVENUE<br>YELLOWSTONE COUNTY AIR POLLUTION CONTROL | SUBURBAN-COMMERCIAL<br>POPULATION ORIENTED | BILLINGS<br>YELLOWSTONE |
| 0080 010 G 02 | GARDEN AVENUE<br>YELLOWSTONE COUNTY AIR POLLUTION CONTROL | SUBURBAN-INDUSTRIAL<br>SOURCE ORIENTED | BILLINGS<br>YELLOWSTONE |
| 0080 011 G 02 | 33RD STREET AND 2ND AVENUE NORTH<br>YELLOWSTONE COUNTY AIR POLLUTION CONTROL | CITY CENTER-COMMERCIAL<br>SOURCE ORIENTED | BILLINGS<br>YELLOWSTONE |
| 0080 014 G 02 | MOUNTAIN VIEW BLVD<br>YELLOWSTONE COUNTY AIR POLLUTION CONTROL | SUBURBAN-RESIDENTIAL<br>SOURCE ORIENTED | BILLINGS<br>YELLOWSTONE |
| 0080 017 G 02 | MINNESOTA AVENUE, 1/2 MI NE OF CONOCO<br>YELLOWSTONE COUNTY AIR POLLUTION CONTROL | SUBURBAN-INDUSTRIAL<br>SOURCE ORIENTED | BILLINGS<br>YELLOWSTONE |
| 0080 018 G 02 | 5TH STREET & SOUTH 28TH<br>YELLOWSTONE COUNTY AIR POLLUTION CONTROL | SUBURBAN-RESIDENTIAL<br>SOURCE ORIENTED | BILLINGS<br>YELLOWSTONE |
| 0080 019 G 02 | SOUTH 27TH & 11TH AVENUE SOUTH<br>YELLOWSTONE COUNTY AIR POLLUTION CONTROL | SUBURBAN-COMMERCIAL<br>SOURCE ORIENTED | BILLINGS<br>YELLOWSTONE |
| 0080 021 G 02 | EAST OF CONOCO REFINERY<br>YELLOWSTONE COUNTY AIR POLLUTION CONTROL | SUBURBAN-INDUSTRIAL<br>SOURCE ORIENTED | BILLINGS<br>YELLOWSTONE |
| 0080 022 G 02 | TWO MOON PARK, A MILE NE OF CONOCO<br>YELLOWSTONE COUNTY AIR POLLUTION CONTROL | SUBURBAN-INDUSTRIAL<br>SOURCE ORIENTED | BILLINGS<br>YELLOWSTONE |

TABLE 1b

AQCR 140 - MONITORING SITE DESCRIPTIONS

| AREA/SITE CODE | SITE NAME/ADDRESS<br>SUPPORTING AGENCY | STATION TYPE<br>PROJECT DESCRIPTION | CITY<br>COUNTY |
|---|---|---|---|
| 0080 025 G 02 | STATE STREET & 3RD SOUTH<br>YELLOWSTONE COUNTY AIR POLLUTION CONTROL | SUBURBAN-RESIDENTIAL<br>SOURCE ORIENTED | BILLINGS<br>YELLOWSTONE |
| 0080 027 G 02 | NEWMAN SCHOOL, STONE & S BILLINGS BLVD<br>YELLOWSTONE COUNTY AIR POLLUTION CONTROL | SUBURBAN-RESIDENTIAL<br>SOURCE ORIENTED | BILLINGS<br>YELLOWSTONE |
| 0080 028 G 02 | BENCH SCHOOL, MILTON ROAD<br>YELLOWSTONE COUNTY AIR POLLUTION CONTROL | SUBURBAN-RESIDENTIAL<br>SOURCE ORIENTED | BILLINGS<br>YELLOWSTONE |
| 0080 032 G 02 | KLENCK LAND, 3/4 MILE S OF EXXON REFINERY<br>YELLOWSTONE COUNTY AIR POLLUTION CONTROL | SUBURBAN-INDUSTRIAL<br>SOURCE ORIENTED | BILLINGS<br>YELLOWSTONE |
| 0080 034 G 02 | PICCOLO & FRONTAGE ROAD<br>YELLOWSTONE COUNTY AIR POLLUTION CONTROL | RURAL-INDUSTRIAL<br>SOURCE ORIENTED | BILLINGS<br>YELLOWSTONE |
| 0080 037 G 02 | JOHNSON & LOCKWOOD<br>YELLOWSTONE COUNTY AIR POLLUTION CONTROL | RURAL-AGRICULTURAL<br>SOURCE ORIENTED | BILLINGS<br>YELLOWSTONE |
| 0080 038 G 02 | JOHNSON ROAD NORTH, 1 MILE NE OF EXXON<br>YELLOWSTONE COUNTY AIR POLLUTION CONTROL | RURAL-AGRICULTURAL<br>SOURCE ORIENTED | BILLINGS<br>YELLOWSTONE |
| 0080 061 G 02 | METRA PARKING LOT,6TH AVE & EXHIBITION DR<br>YELLOWSTONE COUNTY AIR POLLUTION CONTROL | CITY CENTER-COMMERCIAL<br>SOURCE ORIENTED | BILLINGS<br>YELLOWSTONE |
| 0080 062 F 01 | TAFT SCHOOL WEST, 623 S 25TH STREET<br>MONTANA AIR QUALITY BUREAU | CITY CENTER-INDUSTRIAL<br>POPULATION ORIENTED | BILLINGS<br>YELLOWSTONE |
| 0080 062 F 07 | TAFT SCHOOL EAST, 623 S 25TH STREET<br>MONTANA AIR QUALITY BUREAU | CITY CENTER-INDUSTRIAL<br>QA-COLOCATED SAMPLER | BILLINGS<br>YELLOWSTONE |
| 0080 064 F 05 | NORTH JOHNSON LANE<br>MONTANA AIR QUALITY BUREAU | SUBURBAN-INDUSTRIAL<br>SPECIAL STUDIES | BILLINGS<br>YELLOWSTONE |
| 0080 065 F 01 | LOCKWOOD PARK (NAMS SITE)<br>MONTANA AIR QUALITY BUREAU | SUBURBAN-RESIDENTIAL<br>POPULATION ORIENTED | BILLINGS<br>YELLOWSTONE |
| 0080 065 G 02 | LOCKWOOD PARK<br>YELLOWSTONE COUNTY AIR POLLUTION CONTROL | SUBURBAN-RESIDENTIAL<br>SOURCE ORIENTED | BILLINGS<br>YELLOWSTONE |
| 0080 066 F 05 | COBURN ROAD, SOUTH OF BILLINGS<br>MONTANA AIR QUALITY BUREAU | RURAL-NEAR URBAN<br>SPECIAL STUDIES | BILLINGS<br>YELLOWSTONE |
| 0080 065 G 02 | COBURN ROAD<br>YELLOWSTONE COUNTY AIR POLLUTION CONTROL | RURAL-NEAR URBAN<br>SOURCE ORIENTED | BILLINGS<br>YELLOWSTONE |
| 0080 067 G 01 | SANDSTONE SCHOOL, 1440 NUTTER BLVD<br>YELLOWSTONE COUNTY AIR POLLUTION CONTROL | SUBURBAN-RESIDENTIAL<br>POPULATION ORIENTED | BILLINGS<br>YELLOWSTONE |

## TABLE 1C
## AQCR 140 - MONITORING SITE DESCRIPTIONS

| AREA/SITE CODE | SITE NAME/ADDRESS<br>SUPPORTING AGENCY | STATION TYPE<br>PROJECT DESCRIPTION | CITY<br>COUNTY |
|---|---|---|---|
| 0840 001 G 02 | LAUREL JUNIOR HIGH - 410 COLORADO AVE<br>YELLOWSTONE COUNTY AIR POLLUTION CONTROL | CITY CENTER-RESIDENTIAL<br>SOURCE ORIENTED | LAUREL<br>YELLOWSTONE |
| 0840 003 G 02 | ROADHOUSE ROAD - 1 MI NE OF CENEX<br>YELLOWSTONE COUNTY AIR POLLUTION CONTROL | RURAL-INDUSTRIAL<br>SOURCE ORIENTED | LAUREL<br>YELLOWSTONE |
| 0840 004 G 02 | CITY SEW TRTMT PLANT - 3/4 MI W OF CENEX<br>YELLOWSTONE COUNTY AIR POLLUTION CONTROL | RURAL-NEAR URBAN<br>SOURCE ORIENTED | LAUREL<br>YELLOWSTONE |
| 0840 005 G 02 | LAUREL WATER PLANT - 1/2 MI S OF CENEX<br>YELLOWSTONE COUNTY AIR POLLUTION CONTROL | RURAL-NEAR URBAN<br>SOURCE ORIENTED | LAUREL<br>YELLOWSTONE |
| 0840 006 G 02 | WEST LAUREL CHURCH - 1/2 MI WNW OF CENEX<br>YELLOWSTONE COUNTY AIR POLLUTION CONTROL | SUBURBAN-RESIDENTIAL<br>SOURCE ORIENTED | LAUREL<br>YELLOWSTONE |
| 0840 007 G 02 | A & W ROOT BEER - 1/2 MI NNW OF CENEX<br>YELLOWSTONE COUNTY AIR POLLUTION CONTROL | SUBURBAN-COMMERCIAL<br>SOURCE ORIENTED | LAUREL<br>YELLOWSTONE |
| 0840 008 G 02 | EAST OF LAUREL - 3/4 MI NE OF CENEX<br>YELLOWSTONE COUNTY AIR POLLUTION CONTROL | RURAL-NEAR URBAN<br>SOURCE ORIENTED | LAUREL<br>YELLOWSTONE |
| 0840 009 G 02 | FARM EAST OF CENEX - 3/8 MI NE OF CENEX<br>YELLOWSTONE COUNTY AIR POLLUTION CONTROL | RURAL-AGRICULTURAL<br>SOURCE ORIENTED | LAUREL<br>YELLOWSTONE |
| 0840 010 G 02 | ROOTBEER STAND - 1 3/4 MI NE OF CENEX<br>YELLOWSTONE COUNTY AIR POLLUTION CONTROL | SUBURBAN-COMMERCIAL<br>SOURCE ORIENTED | LAUREL<br>YELLOWSTONE |
| 0840 013 G 02 | WEST COOP - 1/4 MI WEST OF CENEX<br>YELLOWSTONE COUNTY AIR POLLUTION CONTROL | RURAL-INDUSTRIAL<br>SOURCE ORIENTED | LAUREL<br>YELLOWSTONE |

## TABLE 2a
## AQCR 140 - TOTAL SUSPENDED PARTICULATES
Micrograms per Cubic Meter

| County/City Site Code | Site Name/Location | Yr | Num Obs | Max Obs | 2nd Max | 3rd Max | Arith Mean | Geom Mean |
|---|---|---|---|---|---|---|---|---|
| Yellowstone/Billings | | | | | | | | |
| 0080 008 G 01 | City Hall | 82 | 55 | 153 | 109 | 107 | 65.4 | 59.9 |
| | | 83 | 55 | 152 | 127 | 107 | 60.3 | 55.6 |
| | | 84 | 58 | 143 | 133 | 131 | 69.5 | 63.3 |
| | | 85 | 59 | 176 | 135 | 130 | 61.5 | 55.8 |
| 0080 008 G 07 | City Hall - Collocated | 82 | 57 | 165 | 112 | 107 | 64.9 | 59.6 |
| | | 83 | 52 | 153 | 127 | 106 | 62.3 | 58.3 |
| | | 84 | 59 | 144 | 139 | 137 | 70.1 | 64.0 |
| | | 85 | 60 | 190 | 143 | 139 | 64.3 | 57.8 |
| 0080 009 G 01 | Grand Avenue School | 82 | 56 | 124 | 119 | 103 | 60.4 | 56.4 |
| | | 83 | 53 | 148 | 143 | 131 | 57.2 | 51.4 |
| | | 84 | 55 | 138 | 106 | 102 | 63.2 | 58.0 |
| | | 85 | 58 | 237 | 165 | 121 | 61.1 | 53.7 |
| 0080 062 F 01 | Taft School | 82 | 56 | 162 | 152 | 149 | 64.2 | 55.0 |
| | | 83 | 56 | 217 | 207 | 203 | 67.0 | 56.3 |
| | | 84 | 54 | 191 | 163 | 153 | 81.0 | 68.6 |
| | | 85 | 44 | 315 | 208 | 153 | 73.3 | 62.6 |
| 0080 062 F 07 | Taft School - Collocated | 82 | 57 | 174 | 142 | 141 | 63.3 | 53.9 |
| | | 83 | 58 | 204 | 203 | 193 | 64.3 | 54.0 |
| | | 84 | 56 | 171 | 162 | 145 | 74.4 | 63.8 |
| | | 85 | 43 | 314 | 201 | 139 | 68.4 | 57.0 |
| 0080 065 F 05 | Lockwood Park | 83 | 21 | 293 | 186 | 148 | 75.9 | 60.1 |
| | | 84 | 57 | 187 | 153 | 148 | 64.5 | 52.8 |
| | | 85 | 57 | 148 | 133 | 123 | 60.7 | 52.0 |

## TABLE 2b
## AQCR 140 - TOTAL SUSPENDED PARTICULATES
Micrograms per Cubic Meter

| County/City Site Code | Site Name/Location | Yr | Num Obs | Max Obs | 2nd Max | 3rd Max | Arith Mean | Geom Mean |
|---|---|---|---|---|---|---|---|---|
| Yellowstone/Billings | | | | | | | | |
| 0080 067 G 01 | Sandstone School | 83 | 47 | 76 | 61 | 54 | 31.2 | 27.9 |
| | | 84 | 54 | 108 | 81 | 72 | 34.8 | 29.8 |
| | | 85 | 57 | 96 | 92 | 71 | 36.3 | 31.8 |
| Yellowstone/Laurel | | | | | | | | |
| 0840 001 G 02 | Laurel Junior High | 82 | 55 | 77 | 74 | 73 | 37.6 | 33.8 |
| | | 83 | 53 | 81 | 59 | 59 | 37.8 | 35.0 |
| | | 84 | 55 | 107 | 92 | 76 | 41.9 | 37.0 |
| | | 85 | 53 | 97 | 91 | 72 | 39.3 | 35.4 |

## TABLE 3
## AQCR 140 - TSP - Number of Exceedances
Micrograms per Cubic Meter

| County/City Site Code | Site Name/Location | Yr | Num Obs | Federal Daily 260 | Prim Annual G 75 | Federal Daily 150 | Sec Annual G 60 | Montana Daily 200 | Std Annual A 75 |
|---|---|---|---|---|---|---|---|---|---|
| Yellowstone/Billings | | | | | | | | | |
| 0080 008 G 01 | City Hall | 85 | 59 | 0 | 0 | 1 | 0 | 0 | 0 |
| 0080 009 G 01 | Grand Avenue School | 85 | 60 | 0 | 0 | 2 | 0 | 1 | 0 |
| 0080 062 F 01 | Taft School | 85 | 44 | 1 | 0 | 3 | 1 | 2 | 0 |
| 0080 065 F 05 | Lockwood Park | 85 | 57 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0080 067 G 01 | Sandstone School | 85 | 57 | 0 | 0 | 0 | 0 | 0 | 0 |
| Yellowstone/Laurel | | | | | | | | | |
| 0840 001 G 02 | Laurel Junior High | 85 | 53 | 0 | 0 | 0 | 0 | 0 | 0 |

## TABLE 4a
## AQCR 140 - CARBON MONOXIDE
Parts Per Million

| Site Code | Site Name/Location | Yr | Mo | Num Obs | Max Obs | 2nd Max | 3rd Max | 8 Hr Max | Monthly Average |
|---|---|---|---|---|---|---|---|---|---|
| 0080 061 F 02 | Metra - Fairgrounds | 82 | 01 | 738 | 17.5 | 11.2 | 6.8 | 5.2 | 1.5 |
| | | | 02 | 583 | 10.9 | 9.1 | 8.4 | 5.3 | 2.0 |
| | | | 03 | 737 | 8.7 | 8.1 | 7.1 | 4.7 | 1.8 |
| | | | 04 | 539 | 12.1 | 4.2 | 4.1 | 3.3 | 1.3 |
| | | | 05 | 175 | 3.0 | 2.5 | 2.5 | 1.8 | 1.0 |
| | | | 06 | 659 | 9.0 | 8.3 | 5.0 | 2.9 | 1.2 |
| | | | 07 | 705 | 10.0 | 5.0 | 4.5 | 3.3 | 1.2 |
| | | | 08 | 565 | 5.2 | 4.9 | 4.0 | 2.5 | 1.0 |
| | | | 09 | 684 | 14.3 | 10.2 | 7.5 | 3.6 | 1.1 |
| | | | 10 | 737 | 9.9 | 9.9 | 8.7 | 5.4 | 1.6 |
| | | | 11 | 431 | 11.5 | 10.5 | 10.5 | 7.3 | 1.8 |
| | | | 12 | --- | --- | --- | --- | --- | --- |
| | | ANNUAL | | 6553 | 17.5 | 14.3 | 12.1 | 7.3 | --- |
| 0080 061 F 02 | Metra - Fairgrounds | 83 | 01 | 680 | 23.9 | 11.2 | 10.9 | 9.8 | 1.9 |
| | | | 02 | 668 | 12.8 | 12.0 | 10.9 | 6.0 | 1.9 |
| | | | 03 | 513 | 12.9 | 11.8 | 8.7 | 6.9 | 1.2 |
| | | | 04 | 704 | 3.4 | 3.0 | 2.9 | 2.0 | .7 |
| | | | 05 | 737 | 4.3 | 3.3 | 3.2 | 2.5 | .9 |
| | | | 06 | 281 | 3.4 | 2.4 | 2.3 | 1.5 | .9 |
| | | | 07 | --- | --- | --- | --- | --- | --- |
| | | | 08 | --- | --- | --- | --- | --- | --- |
| | | | 09 | --- | --- | --- | --- | --- | --- |
| | | | 10 | 435 | 12.6 | 9.7 | 7.6 | 5.9 | 1.7 |
| | | | 11 | 711 | 20.0 | 13.5 | 8.0 | 5.7 | 1.1 |
| | | | 12 | 406 | 8.3 | 7.8 | 7.1 | 4.9 | 1.2 |
| | | ANNUAL | | 5135 | 23.9 | 20.0 | 13.5 | 9.8 | --- |

## TABLE 4b
## AQCR 140 - CARBON MONOXIDE
Parts Per Million

| Site Code | Site Name/Location | Yr | Mo | Num Obs | Max Obs | 2nd Max | 3rd Max | 8 Hr Max | Monthly Average |
|---|---|---|---|---|---|---|---|---|---|
| 0080 061 G 02 | Metra - Fairgrounds | 84 | 01 | --- | --- | --- | --- | --- | --- |
| | | | 02 | 152 | 6.1 | 5.7 | 4.5 | 2.6 | 1.0 |
| | | | 03 | 272 | 5.8 | 5.4 | 4.2 | 2.6 | 0.8 |
| | | | 04 | --- | --- | --- | --- | --- | --- |
| | | | 05 | 102 | 3.5 | 3.3 | 2.2 | 1.6 | 0.7 |
| | | | 06 | 151 | 4.0 | 4.0 | 2.8 | 1.4 | 0.4 |
| | | | 07 | --- | --- | --- | --- | --- | --- |
| | | | 08 | 139 | 1.0 | 0.8 | 0.8 | 0.6 | 0.1 |
| | | | 09 | 216 | 5.7 | 3.4 | 3.4 | 2.9 | 1.2 |
| | | | 10 | 654 | 11.1 | 8.7 | 7.7 | 5.1 | 0.9 |
| | | | 11 | 715 | 6.3 | 6.0 | 5.8 | 4.6 | 1.3 |
| | | | 12 | 705 | 8.0 | 7.8 | 7.7 | 7.0 | 1.4 |
| | | ANNUAL | | 3106 | 11.1 | 8.7 | 8.0 | 7.0 | --- |
| 0080 061 G 02 | Metra - Fairgrounds | 85 | 01 | 500 | 4.8 | 4.5 | 4.4 | 3.3 | 0.8 |
| | | | 02 | 500 | 9.4 | 8.2 | 6.0 | 3.4 | 1.0 |
| | | | 03 | 740 | 8.2 | 6.9 | 5.6 | 4.5 | 1.3 |
| | | | 04 | 715 | 4.1 | 2.9 | 2.7 | 2.0 | 0.7 |
| | | | 05 | 705 | 9.5 | 4.4 | 3.5 | 2.4 | 0.4 |
| | | | 06 | 703 | 4.6 | 3.6 | 3.5 | 2.6 | 0.4 |
| | | | 07 | 737 | 10.5 | 5.1 | 4.9 | 4.0 | 1.4 |
| | | | 08 | 737 | 6.4 | 3.9 | 3.8 | 3.0 | 1.0 |
| | | | 09 | 564 | 3.4 | 3.2 | 2.8 | 2.4 | 0.8 |
| | | | 10 | 377 | 4.4 | 4.3 | 4.3 | 3.5 | 1.3 |
| | | | 11 | 277 | 3.8 | 3.5 | 3.5 | 3.1 | 1.3 |
| | | | 12 | 445 | 4.0 | 3.5 | 3.5 | 2.8 | 1.0 |
| | | ANNUAL | | 7000 | 10.5 | 9.5 | 9.4 | 4.5 | --- |

### TABLE 5
### AQCR 140 - CO - Number of Exceedances
Parts per Million

| County/City<br>Site Code | Site Name/Location | Yr | Num<br>Obs | Federal Prim<br>1-Hr<br>35 | <br>8-Hr<br>9 | Montana Std<br>1-Hr<br>23 | <br>8-Hr<br>9 |
|---|---|---|---|---|---|---|---|
| Yellowstone/Billings | | | | | | | |
| 0080 061 G 02 | Metra-Fairgrounds | 85 | 7000 | 0 | 0 | 0 | 0 |

# TABLE 6a
# AQCR 140 - SULFUR DIOXIDE
Parts Per Million

| Site Code | Site Name/Location | Yr | Mo | Num Obs | Max Obs | 2nd Max | 3rd Max | 3 Hr Max | 24 Hr Max | Monthly Average |
|---|---|---|---|---|---|---|---|---|---|---|
| 0080 064 F 05 | North Johnson Lane | 82 | 01 | 728 | .381 | .328 | .326 | .353 | .111 | .021 |
| | | | 02 | 619 | .355 | .335 | .330 | .230 | .131 | .037 |
| | | | 03 | 693 | .216 | .191 | .163 | .168 | .058 | .014 |
| | | | 04 | 655 | .304 | .210 | .170 | .175 | .048 | .012 |
| | | | 05 | 730 | .220 | .189 | .175 | .194 | .035 | .008 |
| | | | 06 | 700 | .210 | .190 | .175 | .166 | .035 | .011 |
| | | | 07 | 683 | .325 | .266 | .247 | .235 | .051 | .014 |
| | | | 08 | 722 | .425 | .277 | .250 | .226 | .056 | .021 |
| | | | 09 | 549 | .716 | .340 | .320 | .517 | .065 | .025 |
| | | | 10 | 549 | .384 | .320 | .294 | .277 | .096 | .028 |
| | | | 11 | 714 | .250 | .237 | .232 | .206 | .102 | .029 |
| | | | 12 | 734 | .364 | .295 | .269 | .309 | .099 | .029 |
| | | ANNUAL | | 8076 | .716 | .425 | .384 | .517 | .131 | .020 |
| 0080 064 F 05 | North Johnson Lane | 83 | 01 | 737 | .375 | .363 | .338 | .263 | .119 | .040 |
| | | | 02 | 668 | .374 | .324 | .306 | .262 | .083 | .030 |
| | | | 03 | 678 | .357 | .310 | .299 | .259 | .049 | .013 |
| | | | 04 | 708 | .458 | .262 | .215 | .261 | .046 | .007 |
| | | | 05 | 483 | .203 | .192 | .156 | .138 | .052 | .012 |
| | | | 06 | --- | --- | --- | --- | --- | --- | --- |
| | | | 07 | --- | --- | --- | --- | --- | --- | --- |
| | | | 08 | --- | --- | --- | --- | --- | --- | --- |
| | | | 09 | --- | --- | --- | --- | --- | --- | --- |
| | | | 10 | 348 | .253 | .217 | .208 | .181 | .092 | .037 |
| | | | 11 | 716 | .317 | .271 | .266 | .213 | .112 | .029 |
| | | | 12 | 604 | .392 | .364 | .353 | .301 | .120 | .032 |
| | | ANNUAL | | 4942 | .458 | .392 | .375 | .301 | .120 | .024 |

## TABLE 6b
## AQCR 140 - SULFUR DIOXIDE
Parts Per Million

| Site Code | Site Name/Location | Yr | Mo | Num Obs | Max Obs | 2nd Max | 3rd Max | 3 Hr Max | 24 Hr Max | Monthly Average |
|---|---|---|---|---|---|---|---|---|---|---|
| 0080 064 F 05 | North Johnson Lane | 84 | 01 | 722 | .233 | .233 | .226 | .211 | .088 | .025 |
| | | | 02 | 687 | .256 | .219 | .196 | .190 | .067 | .020 |
| | | | 03 | 724 | .160 | .159 | .158 | .136 | .042 | .008 |
| | | | 04 | 329 | .135 | .110 | .070 | .097 | .018 | .002 |
| | | | 05 | 519 | .425 | .228 | .210 | .248 | .053 | .011 |
| | | | 06 | 331 | .170 | .135 | .130 | .119 | .031 | .009 |
| | | | 07 | 57 | .107 | .068 | .068 | .055 | .024 | .015 |
| | | | 08 | 665 | .287 | .268 | .250 | .207 | .048 | .021 |
| | | | 09 | 710 | .520 | .425 | .400 | .448 | .118 | .015 |
| | | | 10 | 61 | .300 | .250 | .210 | .233 | .094 | .062 |
| | | | 11 | --- | --- | --- | --- | --- | --- | --- |
| | | | 12 | 529 | .460 | .315 | .310 | .333 | .098 | .035 |
| | | ANNUAL | | 5334 | .520 | .460 | .425 | .448 | .118 | .018 |
| 0080 064 F 05 | North Johnson Lane | 85 | 01 | 714 | .414 | .410 | .377 | .303 | .149 | .041 |
| | | | 02 | 524 | .274 | .254 | .227 | .215 | .067 | .021 |
| | | | 03 | 675 | .351 | .297 | .291 | .280 | .072 | .016 |
| | | | 04 | 623 | .219 | .196 | .188 | .171 | .038 | .008 |
| | | | 05 | 556 | .219 | .214 | .183 | .152 | .031 | .010 |
| | | | 06 | 710 | .313 | .245 | .217 | .245 | .050 | .008 |
| | | | 07 | 739 | .364 | .256 | .226 | .230 | .061 | .017 |
| | | | 08 | 207 | .187 | .147 | .133 | .152 | .045 | .010 |
| | | | 09 | 447 | .155 | .153 | .106 | .106 | .023 | .005 |
| | | | 10 | 740 | .329 | .254 | .204 | .234 | .066 | .019 |
| | | | 11 | 714 | .367 | .292 | .229 | .233 | .101 | .016 |
| | | | 12 | 640 | .345 | .232 | .221 | .188 | .130 | .033 |
| | | ANNUAL | | 7289 | .414 | .410 | .377 | .303 | .149 | .018 |

TABLE 6c
AQCR 140 - SULFUR DIOXIDE
Parts Per Million

| Site Code | Site Name/Location | Yr | Mo | Num Obs | Max Obs | 2nd Max | 3rd Max | 3 Hr Max | 24 Hr Max | Monthly Average |
|---|---|---|---|---|---|---|---|---|---|---|
| 0080 065 F 05 | Lockwood Park | 82 | 01 | 733 | .267 | .261 | .257 | .223 | .139 | .026 |
| | | | 02 | 663 | .228 | .227 | .210 | .170 | .077 | .034 |
| | | | 03 | 724 | .260 | .250 | .232 | .162 | .075 | .019 |
| | | | 04 | 593 | .657 | .623 | .520 | .600 | .109 | .020 |
| | | | 05 | 733 | .322 | .230 | .200 | .200 | .056 | .014 |
| | | | 06 | 596 | .284 | .227 | .224 | .238 | .067 | .015 |
| | | | 07 | 563 | .287 | .222 | .200 | .187 | .080 | .017 |
| | | | 08 | 716 | .243 | .242 | .239 | .200 | .067 | .024 |
| | | | 09 | 601 | .324 | .248 | .205 | .210 | .063 | .023 |
| | | | 10 | 632 | .278 | .257 | .252 | .230 | .062 | .024 |
| | | | 11 | 713 | .235 | .234 | .218 | .188 | .059 | .026 |
| | | | 12 | 739 | .663 | .542 | .411 | .483 | .173 | .036 |
| | | ANNUAL | | 8106 | .663 | .657 | .623 | .600 | .173 | .023 |
| 0080 065 F 05 | Lockwood Park | 83 | 01 | 736 | .468 | .323 | .252 | .281 | .130 | .033 |
| | | | 02 | 559 | .562 | .490 | .438 | .380 | .104 | .032 |
| | | | 03 | 738 | .500 | .388 | .354 | .344 | .103 | .021 |
| | | | 04 | 700 | .347 | .326 | .233 | .198 | .068 | .019 |
| | | | 05 | 735 | .277 | .183 | .177 | .155 | .056 | .021 |
| | | | 06 | 676 | .442 | .361 | .265 | .325 | .116 | .029 |
| | | | 07 | 731 | .360 | .302 | .290 | .233 | .070 | .031 |
| | | | 08 | 733 | .401 | .388 | .369 | .317 | .103 | .036 |
| | | | 09 | 632 | .527 | .460 | .410 | .392 | .095 | .035 |
| | | | 10 | 431 | .332 | .215 | .202 | .169 | .062 | .033 |
| | | | 11 | 712 | .248 | .189 | .185 | .172 | .091 | .028 |
| | | | 12 | 567 | .175 | .175 | .174 | .157 | .087 | .038 |
| | | ANNUAL | | 7950 | .562 | .527 | .500 | .392 | .130 | .029 |

## TABLE 6d
## AQCR 140 - SULFUR DIOXIDE
Parts Per Million

| Site Code | Site Name/Location | Yr | Mo | Num Obs | Max Obs | 2nd Max | 3rd Max | 3 Hr Max | 24 Hr Max | Monthly Average |
|---|---|---|---|---|---|---|---|---|---|---|
| 0080 065 F 05 | Lockwood Park | 84 | 01 | 734 | .207 | .182 | .170 | .171 | .089 | .042 |
| | | | 02 | 683 | .214 | .182 | .148 | .180 | .068 | .020 |
| | | | 03 | 701 | .225 | .151 | .149 | .146 | .038 | .015 |
| | | | 04 | 716 | .266 | .173 | .170 | .134 | .093 | .013 |
| | | | 05 | 566 | .293 | .253 | .199 | .212 | .039 | .014 |
| | | | 06 | 547 | .219 | .177 | .146 | .144 | .046 | .013 |
| | | | 07 | --- | --- | --- | --- | --- | --- | --- |
| | | | 08 | 459 | .322 | .311 | .255 | .180 | .066 | .029 |
| | | | 09 | 702 | .378 | .271 | .222 | .197 | .067 | .025 |
| | | | 10 | 59 | .328 | .306 | .212 | .277 | .110 | .060 |
| | | | 11 | 84 | .089 | .056 | .054 | .054 | .025 | .017 |
| | | | 12 | 717 | .550 | .400 | .210 | .293 | .067 | .029 |
| | | ANNUAL | | 5968 | .550 | .400 | .378 | .293 | .110 | .023 |
| 0080 065 F 05 | Lockwood Park | 85 | 01 | 688 | .494 | .398 | .326 | .406 | .167 | .037 |
| | | | 02 | 528 | .136 | .129 | .115 | .098 | .049 | .020 |
| | | | 03 | 654 | .176 | .161 | .161 | .142 | .051 | .018 |
| | | | 04 | 561 | .196 | .158 | .144 | .117 | .040 | .013 |
| | | | 05 | 727 | .197 | .188 | .186 | .108 | .030 | .014 |
| | | | 06 | 686 | .394 | .246 | .236 | .314 | .098 | .020 |
| | | | 07 | 732 | .332 | .291 | .213 | .174 | .074 | .023 |
| | | | 08 | 226 | .439 | .226 | .211 | .275 | .069 | .024 |
| | | | 09 | 457 | .201 | .190 | .177 | .177 | .062 | .017 |
| | | | 10 | 739 | .231 | .221 | .217 | .193 | .079 | .019 |
| | | | 11 | 712 | .299 | .282 | .280 | .269 | .104 | .020 |
| | | | 12 | 734 | .373 | .238 | .230 | .222 | .077 | .023 |
| | | ANNUAL | | 7444 | .494 | .439 | .398 | .406 | .167 | .021 |

# TABLE 6e
# AQCR 140 - SULFUR DIOXIDE
Parts Per Million

| Site Code | Site Name/Location | Yr | Mo | Num Obs | Max Obs | 2nd Max | 3rd Max | 3 Hr Max | 24 Hr Max | Monthly Average |
|---|---|---|---|---|---|---|---|---|---|---|
| 0080 066 F 05 | Coburn Road | 82 | 01 | 728 | .409 | .392 | .359 | .314 | .155 | .052 |
| | | | 02 | 601 | .342 | .265 | .231 | .187 | .098 | .043 |
| | | | 03 | 630 | .263 | .242 | .217 | .240 | .071 | .024 |
| | | | 04 | 634 | .310 | .275 | .220 | .261 | .052 | .013 |
| | | | 05 | 649 | .210 | .115 | .111 | .095 | .021 | .007 |
| | | | 06 | 707 | .150 | .131 | .113 | .111 | .035 | .011 |
| | | | 07 | 733 | .227 | .195 | .169 | .135 | .050 | .012 |
| | | | 08 | 734 | .385 | .307 | .270 | .202 | .072 | .028 |
| | | | 09 | 528 | .335 | .275 | .275 | .288 | .074 | .026 |
| | | | 10 | 448 | .331 | .223 | .184 | .231 | .072 | .033 |
| | | | 11 | 151 | .213 | .176 | .149 | .127 | .073 | .051 |
| | | | 12 | 734 | .541 | .373 | .360 | .397 | .140 | .040 |
| | | ANNUAL | | 7277 | .541 | .409 | .392 | .397 | .155 | .026 |
| 0080 066 F 05 | Coburn Road | 83 | 01 | 739 | .778 | .697 | .581 | .650 | .222 | .051 |
| | | | 02 | 668 | .345 | .334 | .275 | .211 | .087 | .036 |
| | | | 03 | 704 | .449 | .357 | .249 | .296 | .086 | .017 |
| | | | 04 | 706 | .263 | .230 | .209 | .180 | .050 | .012 |
| | | | 05 | 733 | .229 | .222 | .217 | .140 | .050 | .011 |
| | | | 06 | 713 | .398 | .312 | .207 | .206 | .045 | .010 |
| | | | 07 | 568 | .195 | .192 | .169 | .157 | .064 | .022 |
| | | | 08 | 525 | .333 | .286 | .267 | .251 | .076 | .036 |
| | | | 09 | 709 | .422 | .417 | .308 | .315 | .119 | .032 |
| | | | 10 | 576 | .399 | .365 | .362 | .341 | .070 | .024 |
| | | | 11 | 646 | .201 | .199 | .184 | .150 | .086 | .038 |
| | | | 12 | 570 | .321 | .243 | .236 | .206 | .108 | .047 |
| | | ANNUAL | | 7857 | .778 | .697 | .581 | .650 | .222 | .027 |

# TABLE 6f
## AQCR 140 - SULFUR DIOXIDE
Parts Per Million

| Site Code | Site Name/Location | Yr | Mo | Num Obs | Max Obs | 2nd Max | 3rd Max | 3 Hr Max | 24 Hr Max | Monthly Average |
|---|---|---|---|---|---|---|---|---|---|---|
| 0080 066 F 05 | Coburn Road | 84 | 01 | 734 | .220 | .212 | .208 | .210 | .088 | .035 |
| | | | 02 | 174 | .145 | .126 | .099 | .088 | .037 | .014 |
| | | | 03 | 633 | .310 | .134 | .131 | .123 | .038 | .011 |
| | | | 04 | 712 | .279 | .196 | .195 | .201 | .042 | .012 |
| | | | 05 | 366 | .218 | .140 | .129 | .109 | .029 | .013 |
| | | | 06 | 158 | .293 | .198 | .141 | .178 | .038 | .020 |
| | | | 07 | --- | --- | --- | --- | --- | --- | --- |
| | | | 08 | 571 | .372 | .268 | .227 | .187 | .069 | .030 |
| | | | 09 | 712 | .362 | .237 | .198 | .207 | .073 | .027 |
| | | | 10 | 85 | .350 | .310 | .300 | .300 | .121 | .076 |
| | | | 11 | --- | --- | --- | --- | --- | --- | --- |
| | | | 12 | 464 | .438 | .418 | .282 | .224 | .120 | .052 |
| | | ANNUAL | | 4609 | .438 | .418 | .372 | .300 | .121 | .026 |
| 0080 066 F 05 | Coburn Road | 85 | 01 | 726 | .996 | .813 | .727 | .845 | .202 | .041 |
| | | | 02 | 567 | .328 | .284 | .246 | .263 | .089 | .022 |
| | | | 03 | 517 | .358 | .253 | .247 | .212 | .120 | .029 |
| | | | 04 | 245 | .240 | .208 | .128 | .119 | .032 | .009 |
| | | | 05 | 580 | .262 | .159 | .142 | .115 | .031 | .011 |
| | | | 06 | 683 | .205 | .170 | .162 | .149 | .044 | .014 |
| | | | 07 | 728 | .334 | .219 | .204 | .169 | .053 | .023 |
| | | | 08 | 72 | .082 | .079 | .061 | .069 | .027 | .016 |
| | | | 09 | 423 | .177 | .152 | .138 | .110 | .034 | .011 |
| | | | 10 | 704 | .502 | .443 | .359 | .408 | .135 | .031 |
| | | | 11 | 635 | .305 | .295 | .288 | .246 | .111 | .031 |
| | | | 12 | 547 | .305 | .290 | .261 | .204 | .099 | .033 |
| | | ANNUAL | | 6427 | .996 | .813 | .727 | .845 | .202 | .024 |

## TABLE 7
## AQCR 140 - SO2 - Number of Exceedances
Parts per Million

| County/City Site Code | Site Name/Location | Yr | Num Obs | Federal Prim 24-Hr 0.14 | Federal Prim Annual 0.03 | Federal Sec 3-Hr 0.50 | Montana Std 1-Hr 0.50 | Montana Std 24-Hr 0.10 | Montana Std Annual 0.20 |
|---|---|---|---|---|---|---|---|---|---|
| Yellowstone/Billings | | | | | | | | | |
| 0080 064 F 05 | North Johnson Lane | 85 | 7289 | 1* | 0 | 0 | 0 | 7 | 0 |
| 0080 065 F 05 | Lockwood Park | 85 | 7444 | 1* | 0 | 0 | 0 | 3 | 1** |
| 0080 066 F 05 | Coburn Road | 85 | 6427 | 1 | 0 | 2 | 4 | 5 | 1** |

* Average is not from midnight to midnight - not a violation

** Insufficient data recovery - not a violation

## TABLE 8a
## AQCR 140 - SULFATION RATE
Milligrams Sulfur Trioxide per 100 Square Centimeters per Day

| County/City Site Code | Site Name/Location | Yr | Num Obs | Max Obs | 2nd Max | 3rd Max | Arith Mean |
|---|---|---|---|---|---|---|---|
| Yellowstone/Billings | | | | | | | |
| 0080 001 G 02 | 214 Pueblo Street | 84 | 12 | .68 | .35 | .34 | .20 |
| | | 85 | 12 | .57 | .55 | .45 | .24 |
| 0080 003 G 02 | Bitterroot | 82 | 12 | .56 | .47 | .40 | .28 |
| | | 83 | 12 | .53 | .52 | .50 | .35 |
| | | 84 | 12 | .82 | .49 | .42 | .36 |
| | | 85 | 12 | .51 | .51 | .47 | .32 |
| 0080 004 G 02 | Johnson Lane | 82 | 12 | 1.09 | .82 | .71 | .51 |
| | | 83 | 11 | 1.19 | 1.03 | .79 | .57 |
| | | 84 | 12 | 1.25 | 1.09 | .94 | .70 |
| | | 85 | 12 | 1.13 | 1.00 | .92 | .64 |
| 0080 006 G 02 | Lockwood School | 82 | 12 | 1.16 | 1.15 | 1.11 | .61 |
| | | 83 | 12 | 1.08 | .99 | .89 | .68 |
| | | 84 | 12 | 1.25 | 1.07 | .94 | .73 |
| | | 85 | 12 | .98 | .87 | .86 | .64 |
| 0080 007 G 01 | KGHL Station | 82 | 12 | .96 | .55 | .53 | .36 |
| | | 83 | 12 | .85 | .55 | .45 | .37 |
| | | 84 | 11 | .81 | .48 | .46 | .28 |
| | | 85 | 12 | .69 | .58 | .44 | .30 |
| 0080 008 G 01 | City Hall | 82 | 12 | .47 | .38 | .31 | .21 |
| | | 83 | 12 | .69 | .45 | .39 | .36 |
| | | 84 | 12 | .56 | .50 | .39 | .24 |
| | | 85 | 12 | .61 | .55 | .49 | .30 |
| 0080 009 G 01 | Grand Avenue School | 82 | 12 | .59 | .39 | .28 | .21 |
| | | 83 | 12 | .62 | .25 | .22 | .36 |
| | | 84 | 12 | .61 | .40 | .35 | .21 |
| | | 85 | 12 | .61 | .54 | .43 | .25 |

## TABLE 8b
## AQCR 140 - SULFATION RATE
Milligrams Sulfur Trioxide per 100 Square Centimeters per Day

| County/City Site Code | Site Name/Location | Yr | Num Obs | Max Obs | 2nd Max | 3rd Max | Arith Mean |
|---|---|---|---|---|---|---|---|
| Yellowstone/Billings | | | | | | | |
| 0080 010 G 02 | Garden Avenue | 82 | 12 | .35 | .33 | .30 | .20 |
| | | 83 | 12 | .55 | .27 | .25 | .21 |
| | | 84 | 12 | .36 | .28 | .19 | .13 |
| | | 85 | 12 | .51 | .28 | .27 | .21 |
| 0080 011 G 02 | 33rd Street & 2nd Avenue North | 82 | 12 | .37 | .28 | .21 | .15 |
| | | 83 | 12 | .51 | .32 | .28 | .19 |
| | | 84 | 12 | .45 | .36 | .26 | .17 |
| | | 85 | 11 | .54 | .45 | .26 | .22 |
| 0080 014 G 02 | Mountain View Boulevard | 82 | 12 | .31 | .30 | .23 | .16 |
| | | 83 | 12 | .58 | .41 | .24 | .19 |
| | | 84 | 12 | .56 | .45 | .29 | .20 |
| | | 85 | 12 | .50 | .46 | .37 | .22 |
| 0080 017 G 02 | Minnesota Avenue | 82 | 12 | .82 | .71 | .63 | .45 |
| | | 83 | 12 | .88 | .67 | .66 | .46 |
| | | 84 | 12 | .86 | .79 | .78 | .47 |
| | | 85 | 12 | .78 | .73 | .66 | .45 |
| 0080 018 G 02 | 5th Street & South 28th | 82 | 11 | .67 | .56 | .48 | .35 |
| | | 83 | 12 | .69 | .50 | .36 | .32 |
| | | 84 | 12 | .55 | .51 | .45 | .30 |
| | | 85 | 12 | .66 | .56 | .39 | .31 |
| 0080 019 G 02 | South 27th & 11th Avenue South | 82 | 10 | 1.05 | .94 | .53 | .51 |
| | | 83 | 12 | 1.10 | .69 | .67 | .50 |
| | | 84 | 12 | .88 | .71 | .60 | .45 |
| | | 85 | 12 | .92 | .85 | .82 | .54 |
| 0080 021 G 02 | East of Conoco | 82 | 11 | 1.32 | 1.09 | .61 | .59 |
| | | 83 | 12 | .99 | .86 | .67 | .53 |
| | | 84 | 12 | 1.20 | .97 | .73 | .57 |
| | | 85 | 11 | .96 | .93 | .81 | .57 |

## TABLE 3c
## AQCR 140 - SULFATION RATE
Milligrams Sulfur Trioxide per 100 Square Centimeters per Day

| County/City Site Code | Site Name/Location | Yr | Num Obs | Max Obs | 2nd Max | 3rd Max | Arith Mean |
|---|---|---|---|---|---|---|---|
| Yellowstone/Billings | | | | | | | |
| 0080 022 G 02 | Two Moon Park | 82 | 12 | 1.34 | 1.17 | 1.09 | .67 |
| | | 83 | 12 | 1.43 | 1.22 | .91 | .74 |
| | | 84 | 12 | 1.57 | 1.23 | .86 | .73 |
| | | 85 | 12 | 1.30 | 1.23 | .94 | .69 |
| 0080 025 G 02 | State Street & 3rd South | 84 | 12 | .79 | .60 | .48 | .37 |
| | | 85 | 12 | .90 | .72 | .55 | .40 |
| 0080 027 G 02 | Newman School | 82 | 11 | .53 | .48 | .47 | .26 |
| | | 83 | 11 | .68 | .49 | .44 | .32 |
| | | 84 | 12 | .71 | .56 | .31 | .25 |
| | | 85 | 12 | .76 | .55 | .33 | .28 |
| 0080 028 G 02 | Bench School | 82 | 12 | .36 | .33 | .26 | .18 |
| | | 83 | 12 | .57 | .38 | .36 | .24 |
| | | 84 | 12 | .69 | .49 | .44 | .28 |
| | | 85 | 12 | .55 | .49 | .44 | .28 |
| 0080 032 G 02 | Klenck Lane | 82 | 12 | 1.27 | 1.22 | 1.19 | .64 |
| | | 83 | 12 | 1.28 | .99 | .95 | .63 |
| | | 84 | 12 | 1.29 | 1.08 | .88 | .64 |
| | | 85 | 12 | 1.39 | .98 | .96 | .66 |
| 0080 034 G 02 | Piccolo and Frontage Road | 82 | 12 | 1.58 | 1.38 | 1.34 | 1.14 |
| | | 83 | 12 | 1.54 | 1.41 | 1.08 | .98 |
| | | 84 | 12 | 1.79 | 1.45 | 1.33 | 1.02 |
| | | 85 | 12 | 1.38 | 1.29 | 1.19 | .99 |
| 0080 037 G 02 | Johnson and Lockwood | 82 | 12 | 1.46 | 1.41 | 1.40 | .79 |
| | | 83 | 11 | 1.90 | 1.71 | 1.21 | .94 |
| | | 84 | 12 | 2.43 | 1.38 | 1.04 | .96 |
| | | 85 | 10 | 1.65 | 1.48 | 1.41 | .93 |

## TABLE 8d
## AQCR 140 - SULFATION RATE
### Milligrams Sulfur Trioxide per 100 Square Centimeters per Day

| County/City Site Code | Site Name/Location | Yr | Num Obs | Max Obs | 2nd Max | 3rd Max | Arith Mean |
|---|---|---|---|---|---|---|---|
| Yellowstone/Billings | | | | | | | |
| 0080 038 G 02 | Johnson Road North | 82 | 12 | 1.46 | 1.38 | 1.15 | .83 |
| | | 83 | 12 | 1.60 | 1.58 | 1.39 | .91 |
| | | 84 | 12 | 2.43 | 1.44 | 1.41 | 1.12 |
| | | 85 | 12 | 1.80 | 1.68 | 1.51 | .95 |
| 0080 061 G 02 | Metra Parking Lot | 84 | 11 | .75 | .62 | .59 | .38 |
| | | 85 | 12 | .85 | .65 | .60 | .41 |
| 0080 065 G 02 | Lockwood Park | 84 | 12 | 1.37 | .96 | .89 | .73 |
| | | 85 | 12 | .87 | .84 | .81 | .66 |
| 0080 066 G 02 | Coburn Road | 84 | 12 | 2.15 | 1.62 | 1.55 | 1.02 |
| | | 85 | 12 | 1.89 | 1.70 | 1.61 | 1.06 |
| 0080 067 G 02 | Sandstone School | 84 | 8 | .49 | .32 | .24 | .18 |
| | | 85 | 12 | .47 | .29 | .22 | .14 |
| Yellowstone/Laurel | | | | | | | |
| 0840 001 G 02 | Laurel Junior High | 82 | 10 | .43 | .17 | .09 | .10 |
| | | 83 | 12 | .50 | .16 | .16 | .11 |
| | | 84 | 12 | .23 | .21 | .20 | .08 |
| | | 85 | 12 | .38 | .37 | .19 | .13 |
| 0840 003 G 02 | Roadhouse Road | 82 | 12 | 1.03 | .81 | .65 | .43 |
| | | 83 | 12 | 1.05 | 1.04 | .73 | .48 |
| | | 84 | 12 | 1.49 | .96 | .86 | .55 |
| | | 85 | 12 | 1.50 | 1.15 | 1.02 | .64 |
| 0840 004 G 02 | City Sewage Treatment Plant | 82 | 12 | .69 | .67 | .61 | .48 |
| | | 83 | 8 | .88 | .64 | .54 | .51 |
| | | 84 | 12 | .64 | .60 | .58 | .48 |
| | | 85 | 11 | .78 | .67 | .51 | .48 |

## TABLE 3e
## AQCR 140 - SULFATION RATE
### Milligrams Sulfur Trioxide per 100 Square Centimeters per Day

| County/City Site Code | Site Name/Location | Yr | Num Obs | Max Obs | 2nd Max | 3rd Max | Arith Mean |
|---|---|---|---|---|---|---|---|
| Yellowstone/Laurel | | | | | | | |
| 0840 005 G 02 | Laurel Water Plant | 82 | 12 | .64 | .62 | .61 | .42 |
| | | 83 | 12 | .66 | .62 | .59 | .43 |
| | | 84 | 12 | .67 | .66 | .65 | .49 |
| | | 85 | 12 | .78 | .70 | .60 | .49 |
| 0840 006 G 02 | West Laurel Church | 82 | 10 | .43 | .22 | .17 | .13 |
| | | 83 | 12 | .52 | .20 | .20 | .17 |
| | | 84 | 12 | .27 | .26 | .22 | .14 |
| | | 85 | 10 | .40 | .23 | .22 | .16 |
| 0840 007 G 02 | A & W Root Beer | 84 | 12 | .29 | .26 | .23 | .11 |
| | | 85 | 12 | .44 | .28 | .28 | .17 |
| 0840 008 G 02 | East of Laurel | 82 | 12 | 1.35 | 1.04 | .92 | .65 |
| | | 83 | 12 | 1.76 | 1.25 | .86 | .72 |
| | | 84 | 12 | 2.42 | 1.29 | 1.14 | .89 |
| | | 85 | 12 | 1.85 | 1.56 | 1.43 | .91 |
| 0840 009 G 02 | Farm East of CENEX | 82 | 10 | 1.51 | 1.16 | .99 | .77 |
| | | 83 | 11 | 2.00 | 1.60 | 1.37 | .90 |
| | | 84 | 12 | 2.74 | 1.46 | 1.06 | 1.03 |
| | | 85 | 12 | 1.67 | 1.51 | 1.28 | .96 |
| 0840 010 G 02 | Root Beer Stand | 84 | 12 | 1.52 | .93 | .62 | .52 |
| | | 85 | 12 | 1.31 | 1.02 | .76 | .54 |
| 0840 013 G 02 | West Coop | 82 | 9 | .26 | .24 | .18 | .15 |
| | | 83 | 11 | .46 | .32 | .23 | .19 |
| | | 84 | 12 | .31 | .24 | .24 | .15 |
| | | 85 | 12 | .39 | .38 | .37 | .23 |

# AQCR 141

# AQCR 141

## INTRODUCTION

This section deals with the air monitoring activities and pollution concerns in AQCR 141.

## LOCATION AND PHYSICAL FEATURES

AQCR 141 is located in north central Montana. Glaciated plain is the main physical feature. There are some foothills and mountainous areas along the western edge (Continental Divide) and south of Havre (Bearpaw Mountains).

The Missouri River flows from west to east in the southern portion of the region. Several other tributary rivers of the Missouri also flow from west to east in the region. Figure 2 shows a regional map.

## POPULATION

The population of AQCR 141 is 146,600 (1984 estimate) or 17.8 percent of the state population. The majority of the people in the region live in Cascade County (Great Falls).

## POLLUTION SOURCES

Pollution sources and types of pollutants are listed for each county in the region. A final category lists the types of sources that would be expected in all counties in the region. The sources by county are as follows:

Cascade County

Several grain processing and feed mills (particulates)

Oil refinery (particulates, $SO_2$, NOx, CO, VOC)

Vermiculite manufacturing (particulates)

Glacier County

Two gas sweetening plants ($SO_2$, NOx)

Oil refinery ($SO_2$, NOx, CO)

All Counties

Asphalt plants (particulates)

Gravel crushers (particulates)

Home heating devices (particulates, CO)

Automobiles (CO, NOx, re-entrained particulates)

Agricultural activities (particulates)

Wind erosion (particulates)

## MONITORING SITE DESCRIPTIONS

A number of monitoring sites were in operation during 1985. Table 9 lists the monitoring site descriptions. This includes site codes, site name, supporting agency, station type, project description, city name and county name.

## DATA SUMMARY

### Total Suspended Particulates

TSP was monitored at four sites in this region in 1985. One of the sites was collocated. The maximum 24-hour observation was 264 $ug/m^3$ at the Fire Station #1 site. The highest annual geometric average was 65.8 $ug/m^3$ and the highest annual arithmetic average was 78.7 $ug/m^3$ at the

Fire Station #1 site. Table 10 summarizes the TSP data for this region and Table 11 shows the number of exceedances for TSP.

### Carbon Monoxide

Carbon monoxide was monitored at one locations (Pardis Clinic) in this region. The maximum one hour observation was 11.1 ppm. The maximum eight hour observation was 8.1 ppm. There were no violations of the one hour standard or the eight hour standard. Table 12 summarizes the CO data for this region and Table 13 shows the number of exceedances compared to the CO standards.

### Sulfation Rate

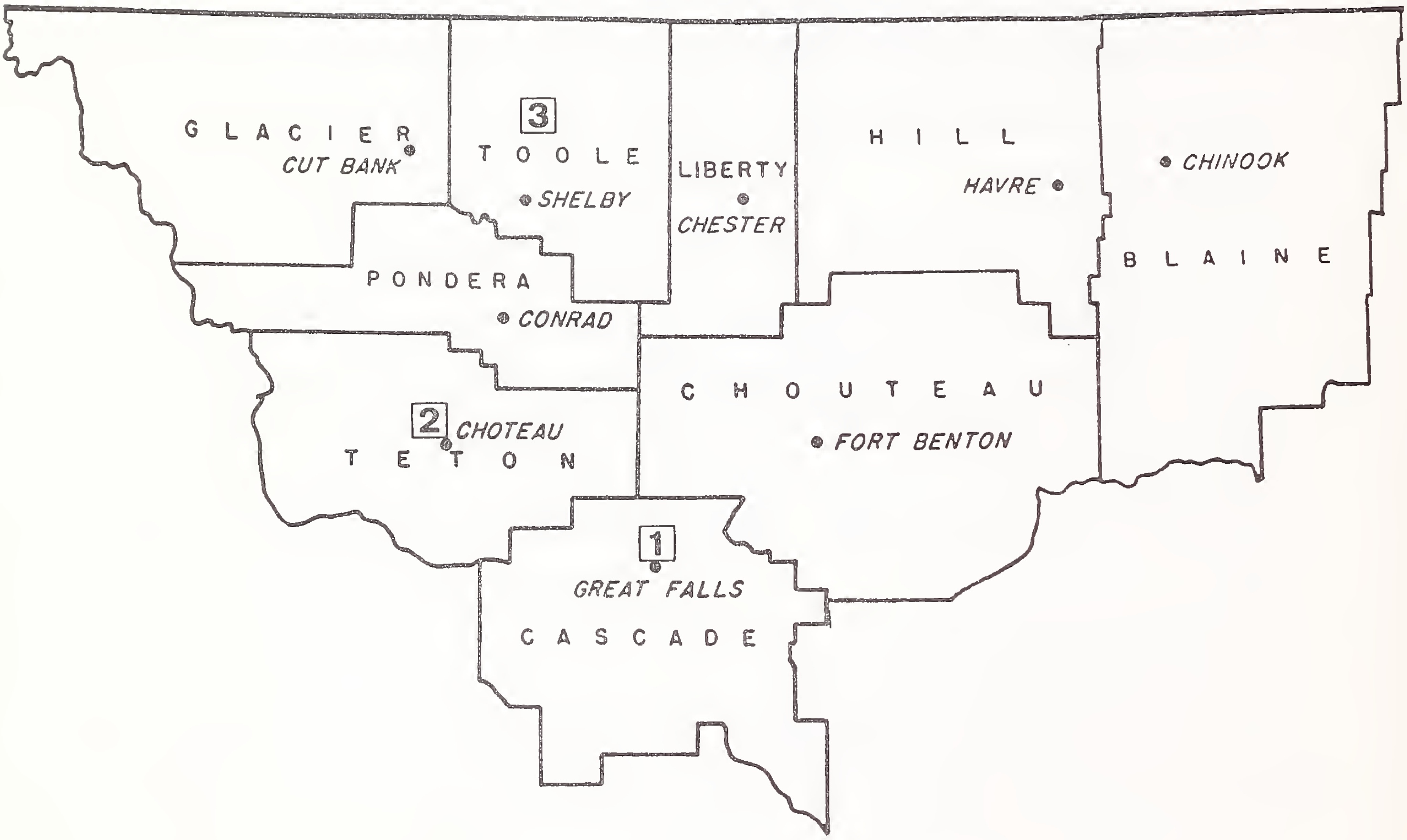
Sulfation rate was measured at two sites in this region. One site was for background monitoring (Circle 8 Ranch) and the other site was to monitor levels around oil/gas development (Anabelle Sheets Residence). The highest monthly average was 0.22 mg $SO_3/cm^2/day$. There is no standard for sulfation rate. Table 14 summarizes the sulfation rate data.

### Respirable Particulates (PM10)

Particulate matter less than 10 microns (PM10) was monitored at one site in Cascade County. The maximum 24-hour observation was 31 $ug/m^3$. There is no standard for particulate matter using this method, but it does give an indication of the respirable portion of the TSP concentrations. Table 15 summarizes the PM10 data for this region.

FIGURE 2

AQCR 141 - REGION MAP


GLACIER
CUT BANK
3
TOOLE
SHELBY
LIBERTY
CHESTER
HILL
HAVRE
CHINOOK
BLAINE
PONDERA
CONRAD
CHOUTEAU
FORT BENTON
2
CHOTEAU
TETON
1
GREAT FALLS
CASCADE

MONITORING SITE LOCATIONS

1. Great Falls
2. Choteau
3. Oilmont

## TABLE 9
## AQCR 141 - MONITORING SITE DESCRIPTIONS

| AREA/SITE CODE | SITE NAME/ADDRESS<br>SUPPORTING AGENCY | STATION TYPE<br>PROJECT DESCRIPTION | CITY<br>COUNTY |
|---|---|---|---|
| 0560 009 G 01 | FIRE STATION #1 - 7TH ST & 1ST AVE SOUTH<br>CASCADE COUNTY HEALTH DEPARTMENT | CITY CENTER-RESIDENTIAL<br>POPULATION ORIENTED | GREAT FALLS<br>CASCADE |
| 0560 017 G 01 | DOWNTOWN (WEST) - 301 2ND AVE N<br>CASCADE COUNTY HEALTH DEPARTMENT | CITY CENTER-COMMERCIAL<br>POPULATION ORIENTED | GREAT FALLS<br>CASCADE |
| 0560 017 G 07 | DOWNTOWN (EAST) - 301 2ND AVE N<br>CASCADE COUNTY HEALTH DEPARTMENT | CITY CENTER-COMMERCIAL<br>QA-COLOCATED SAMPLER | GREAT FALLS<br>CASCADE |
| 0560 019 G 01 | BLACK EAGLE PO - 1321 SMELTER AVE<br>CASCADE COUNTY HEALTH DEPARTMENT | CITY CENTER-COMMERCIAL<br>POPULATION ORIENTED | GREAT FALLS<br>CASCADE |
| 0560 023 G 02 | PARDIS CLINIC - 826 10TH AVE SOUTH<br>CASCADE COUNTY HEALTH DEPARTMENT | CITY CENTER-COMMERCIAL<br>SOURCE ORIENTED | GREAT FALLS<br>CASCADE |
| 1560 004 N 05 | CIRCLE 8 RANCH, BOX 729<br>MONTANA AIR QUALITY BUREAU AND BLM | REMOTE<br>SPECIAL STUDIES | CHOTEAU<br>TETON |
| 1550 006 F 05 | ANABELLE SHEETS RESIDENCE, HIWAY 91<br>MONTANA AIR QUALITY BUREAU | RURAL-AGRICULTURAL<br>SPECIAL STUDIES | OILMONT<br>TOOLE |

## TABLE 10
## AQCR 141 - TOTAL SUSPENDED PARTICULATES
Micrograms per Cubic Meter

| County/City Site Code | Site Name/Location | Yr | Num Obs | Max Obs | 2nd Max | 3rd Max | Arith Mean | Geom Mean |
|---|---|---|---|---|---|---|---|---|
| Cascade/Great Falls | | | | | | | | |
| 0660 009 G 01 | Fire Station #1 | 82 | 52 | 204 | 179 | 158 | 78.5 | 67.1 |
| | | 83 | 57 | 163 | 112 | 105 | 55.2 | 49.6 |
| | | 84 | 59 | 175 | 174 | 165 | 71.9 | 63.3 |
| | | 85 | 55 | 264 | 225 | 208 | 78.7 | 65.8 |
| 0660 017 G 01 | Downtown | 82 | 50 | 107 | 106 | 105 | 54.2 | 48.7 |
| | | 83 | 57 | 108 | 105 | 87 | 46.7 | 42.2 |
| | | 84 | 51 | 120 | 93 | 89 | 50.9 | 45.8 |
| | | 85 | 59 | 169 | 125 | 121 | 52.6 | 45.6 |
| 0660 017 G 01 | Downtown - Collocated | 82 | 55 | 104 | 104 | 93 | 52.5 | 47.4 |
| | | 83 | 60 | 110 | 89 | 88 | 47.0 | 42.4 |
| | | 84 | 61 | 116 | 115 | 96 | 51.0 | 45.3 |
| | | 85 | 60 | 172 | 122 | 116 | 50.3 | 43.1 |
| 0660 019 G 01 | Black Eagle PO | 82 | 60 | 216 | 144 | 140 | 73.3 | 65.5 |
| | | 83 | 58 | 201 | 171 | 128 | 63.4 | 55.6 |
| | | 84 | 59 | 175 | 134 | 130 | 63.9 | 55.9 |
| | | 85 | 59 | 225 | 204 | 150 | 64.3 | 52.6 |
| Teton/Choteau | | | | | | | | |
| 1560 004 N 05 | Circle 8 Ranch | 85 | 39 | 41 | 36 | 34 | 16.8 | 13.5 |

## TABLE 11
## AQCR 141 - TSP - Number of Exceedances
Micrograms per Cubic Meter

| County/City Site Code | Site Name/Location | Yr | Num Obs | Federal Daily 260 | Prim Annual G 75 | Federal Daily 150 | Sec Annual G 60 | Montana Daily 200 | Std Annual A 75 |
|---|---|---|---|---|---|---|---|---|---|
| Cascade/Great Falls | | | | | | | | | |
| 0660 009 G 01 | Fire Station #1 | 85 | 55 | 1 | 0 | 5 | 1 | 3 | 1 |
| 0660 017 G 01 | Downtown | 85 | 59 | 0 | 0 | 1 | 0 | 0 | 0 |
| 0660 019 G 01 | Black Eagle PO | 85 | 59 | 0 | 0 | 3 | 0 | 2 | 0 |
| Teton/Choteau | | | | | | | | | |
| 1560 004 N 05 | Circle 8 Ranch | 85 | 39 | 0 | 0 | 0 | 0 | 0 | 0 |

## TABLE 12a
## AQCR 141 - CARBON MONOXIDE
Parts Per Million

| County/City Site Code | Site Name/Location | Yr | Mo | Num Obs | Max Obs | 2nd Max | 3rd Max | 8 Hr Max | Monthly Average |
|---|---|---|---|---|---|---|---|---|---|
| 0660 023 G 02 | Pardis Clinic | 83 | 01 | --- | --- | --- | --- | --- | --- |
| | | | 02 | --- | --- | --- | --- | --- | --- |
| | | | 03 | --- | --- | --- | --- | --- | --- |
| | | | 04 | --- | --- | --- | --- | --- | --- |
| | | | 05 | --- | --- | --- | --- | --- | --- |
| | | | 06 | --- | --- | --- | --- | --- | --- |
| | | | 07 | --- | --- | --- | --- | --- | --- |
| | | | 08 | --- | --- | --- | --- | --- | --- |
| | | | 09 | --- | --- | --- | --- | --- | --- |
| | | | 10 | --- | --- | --- | --- | --- | --- |
| | | | 11 | 500 | 9.0 | 8.7 | 8.3 | 10.3 | 1.6 |
| | | | 12 | 742 | 20.3 | 16.9 | 16.6 | 6.7 | 2.6 |
| | | ANNUAL | | 1242 | 20.3 | 16.9 | 16.6 | 10.3 | --- |
| 0660 023 G 02 | Pardis Clinic | 84 | 01 | 691 | 9.4 | 7.9 | 7.8 | 5.5 | 1.1 |
| | | | 02 | 653 | 18.8 | 18.0 | 17.0 | 14.5 | 1.1 |
| | | | 03 | 738 | 8.7 | 7.0 | 6.9 | 6.6 | 1.8 |
| | | | 04 | 626 | 5.6 | 5.5 | 5.4 | 4.6 | 1.3 |
| | | | 05 | 740 | 6.7 | 5.0 | 3.8 | 3.1 | 0.8 |
| | | | 06 | 594 | 9.2 | 7.9 | 5.9 | 4.0 | 1.0 |
| | | | 07 | 736 | 6.9 | 6.4 | 6.3 | 4.4 | 1.3 |
| | | | 08 | 680 | 10.0 | 9.0 | 6.6 | 5.8 | 1.6 |
| | | | 09 | 554 | 8.8 | 6.2 | 5.6 | 4.6 | 1.4 |
| | | | 10 | 736 | 8.8 | 8.3 | 7.4 | 4.6 | 1.4 |
| | | | 11 | 716 | 10.6 | 9.0 | 9.0 | 6.3 | 1.1 |
| | | | 12 | 361 | 12.7 | 12.5 | 12.3 | 8.0 | 2.2 |
| | | ANNUAL | | 7825 | 18.8 | 18.0 | 17.0 | 14.5 | --- |

## TABLE 12b
## AQCR 141 - CARBON MONOXIDE
Parts Per Million

| County/City Site Code | Site Name/Location | Yr | Mo | Num Obs | Max Obs | 2nd Max | 3rd Max | 8 Hr Max | Monthly Average |
|---|---|---|---|---|---|---|---|---|---|
| 0660 023 G 02 | Pardis Clinic | 85 | 01 | 673 | 10.8 | 10.7 | 10.0 | 8.1 | 2.3 |
| | | | 02 | 587 | 11.1 | 9.2 | 6.7 | 5.3 | 1.4 |
| | | | 03 | 738 | 8.0 | 7.4 | 6.9 | 6.1 | 2.1 |
| | | | 04 | 714 | 6.3 | 5.8 | 5.8 | 4.3 | 1.4 |
| | | | 05 | 643 | 6.1 | 5.7 | 5.3 | 3.7 | 1.2 |
| | | | 06 | 716 | 7.8 | 5.2 | 4.9 | 4.1 | 1.2 |
| | | | 07 | 739 | 6.0 | 6.0 | 5.7 | 3.5 | 1.6 |
| | | | 08 | 512 | 8.5 | 6.4 | 6.2 | 4.7 | 1.4 |
| | | | 09 | 713 | 8.8 | 7.2 | 6.6 | 5.6 | 1.3 |
| | | | 10 | 738 | 10.8 | 7.1 | 6.7 | 4.4 | 1.0 |
| | | | 11 | 712 | 7.8 | 6.7 | 6.4 | 5.2 | 1.5 |
| | | | 12 | 331 | 8.3 | 7.7 | 6.7 | 4.9 | 1.1 |
| | | ANNUAL | | 7817 | 11.1 | 10.8 | 10.8 | 8.1 | --- |

## TABLE 13
## AQCR 141 - CO - Number of Exceedances
Parts per Million

| County/City Site Code | Site Name/Location | Yr | Num Obs | Federal Prim 1-Hr 35 | Federal Prim 8-Hr 9 | Montana Std 1-Hr 23 | Montana Std 8-Hr 9 |
|---|---|---|---|---|---|---|---|
| Cascade/Great Falls | | | | | | | |
| 0660 023 G 02 | Pardis Clinic | 85 | 7817 | 0 | 0 | 0 | 0 |

## TABLE 14
## AQCR 141 - SULFATION RATE
Milligrams Sulfur Trioxide per 100 Square Centimeters per Day

| County/City Site Code | Site Name/Location | Yr | Num Obs | Max Obs | 2nd Max | 3rd Max | Arith Mean |
|---|---|---|---|---|---|---|---|
| Teton/Choteau | | | | | | | |
| 1560 004 N 05 | Circle 8 Ranch | 85 | 9 | .01 | .00 | .00 | .00 |
| Toole/Oilmont | | | | | | | |
| 1580 008 F 05 | Anabelle Sheets Residence | 85 | 11 | .22 | .15 | .09 | .05 |

## TABLE 15
## AQCR 141 - RESPIRABLE PARTICULATES (PM10)
Micrograms per Cubic Meter

| County/City<br>Site Code | Site Name/Location | Yr | Num Obs | Max Obs | 2nd Max | 3rd Max | Arith Mean |
|---|---|---|---|---|---|---|---|
| Cascade/Great Falls | | | | | | | |
| 0660 017 G 01 | Downtown | 85 | 10 | 31 | 18 | 16 | 13.9 |

# AQCR 142

# AQCR 142

## INTRODUCTION

This section deals with the air monitoring activities and pollution concerns in AQCR 142.

## LOCATION AND PHYSICAL FEATURES

AQCR 142 is located in the southwest corner of the state. The Continental Divide borders the southern edge of the region and then cuts up through the northern portion. The region contains several distinct mountain ranges separated by fairly wide valleys. Tributaries for the Missouri, Clark Fork and Yellowstone Rivers have their beginnings in this area. Figure 3 shows a regional map.

## POPULATION

The population of AQCR 142 is 191,000 (1984 estimate) or 23.2 percent of the state population. The main population centers in the region are in Lewis & Clark County (Helena), Gallatin County (Bozeman), and Silver Bow County (Butte).

## POLLUTION SOURCES

Pollution sources and types of pollutants are listed for each county in the region. A final category lists the types of sources that would be expected in all counties in the region. The sources by county are as follows:

Beaverhead County

- Sawmill (particulates)
- Talc production (particulates)

Broadwater County

- Sawmill (particulates)
- Lime production (particulates)

Deer Lodge County

- Iron casting (particulates)
- Smelter demolition (particulates, metals)

Gallatin County

- Ethanol plant (particulates, $SO_2$, NOx, CO)
- Cement production (particulates)
- Talc production (particulates)
- Sawmill (particulates)

Granite County

- Sawmill (particulates)

Jefferson County

- Cement production (particulates)
- Gold mining (particulates)

Lewis & Clark County

- Primary lead smelter (particulates, $SO_2$, lead)
- Paint pigment manufacturing (particulates, $SO_2$, VOC, metals)

Madison County

- Talc mining (particulates)

Park County

- Solid waste incinerator (particulates)
- Several sawmills (particulates, CO)

Silver Bow County

- Elemental phosphorus manufacturing (particulates, fluoride)
- Open pit copper mine (particulates) -- curtailed

All Counties

- Asphalt plants (particulates)
- Gravel crushers (particulates)
- Home heating devices (particulates, CO)
- Automobiles (CO, NOx, re-entrained particulates)
- Agricultural activity (particulates)
- Wind erosion (particulates)

## MONITORING SITE DESCRIPTIONS

A number of monitoring sites were in operation during 1985. Table 16 lists the monitoring site descriptions. This includes site codes, site name, supporting agency, station type, project description, city name and county name.

## DATA SUMMARY

### Total Suspended Particulates

TSP was monitored at eighteen sites in this region. One of the sites was collocated. The maximum 24-hour observation was 397 ug/m$^3$ at the Capital Court site in Helena and the second maximum was 314 ug/m$^3$ at the Greeley School site in Butte. The highest annual geometric average was 62.5 ug/m$^3$ at the Montana City School site. One site had violations of the federal primary 24-hour standard: the Greeley School site in Butte. There were no violations of the federal annual primary standard. Four sites had violations of the Montana 24-hour standard: Capital

Courts, Montana City, Firehall, and Greeley. One site had a violation of the Montana annual standard: Montana City School. Table 17 summarizes the TSP data for this region and Table 18 shows the number of exceedances.

### Aluminum

Aluminum was analyzed from hi-vol filters at one site (Hiway Junction) in this region. The maximum 24-hour observation was 0.56 $ug/m^3$. There is no air pollution standard for aluminum. Table 19 summarizes the aluminum data for this region.

### Arsenic

Arsenic was analyzed from hi-vol filters at seven sites in this region. One of the sites was collocated. The maximum 24-hour observation was 2.710 $ug/m^3$ at the Firehall site in East Helena. There is no air pollution standard for arsenic; however, the levels are elevated above background and to show an impact from mining/smelting industries. Table 20 summarizes the arsenic data for this region.

### Cadmium

Cadmium was analyzed from hi-vol filters at six sites in this region. One of the sites was collocated. The maximum 24-hour observation was 0.540 $ug/m^3$ at the Hastie site in East Helena. There is no air pollution standard for cadmium. Table 21 summarizes the cadmium data for this region.

### Chromium

Chromium was analyzed from hi-vol filters at one site (Hiway Junction) in this region. The maximum 24-hour observation was 0.12 $ug/m^3$. There is no air pollution standard for chromium. Table 22 summarizes the chromium data for this region.

### Copper

Copper was analyzed from hi-vol filters at six sites in this region. One of the sites was collocated. The maximum 24-hour observation was 64.52 ug/m$^3$ at the Hadfield site in East Helena. The highest annual average was 5.88 ug/m$^3$ (at Firehall) and represents about 8 percent by weight of the particulate concentration. There is no air pollution standard for copper. Table 23 summarizes the copper data for this region.

### Lead

Lead was analyzed from hi-vol filters at eight sites in this region. One of the sites was collocated. The maximum 24-hour observation was 17.08 ug/m$^3$ at the Firehall site in East Helena. The highest annual average was 3.34 ug/m$^3$ at the Firehall site and represents about 5 percent by weight of the particulate concentration. The highest quarterly average was 5.46 ug/m$^3$ at the Firehall site in East Helena. There were thirteen violations of the Federal calendar quarter standard. Although the quarterly averages are above 1.5 ug/m$^3$ there has been some downward trends due to control measure instituted at the primary lead smelter. Table 24 summarizes the daily lead data for this region; Table 25 summarizes the quarterly lead data; Table 26 shows the number of exceedances of the lead standards.

### Zinc

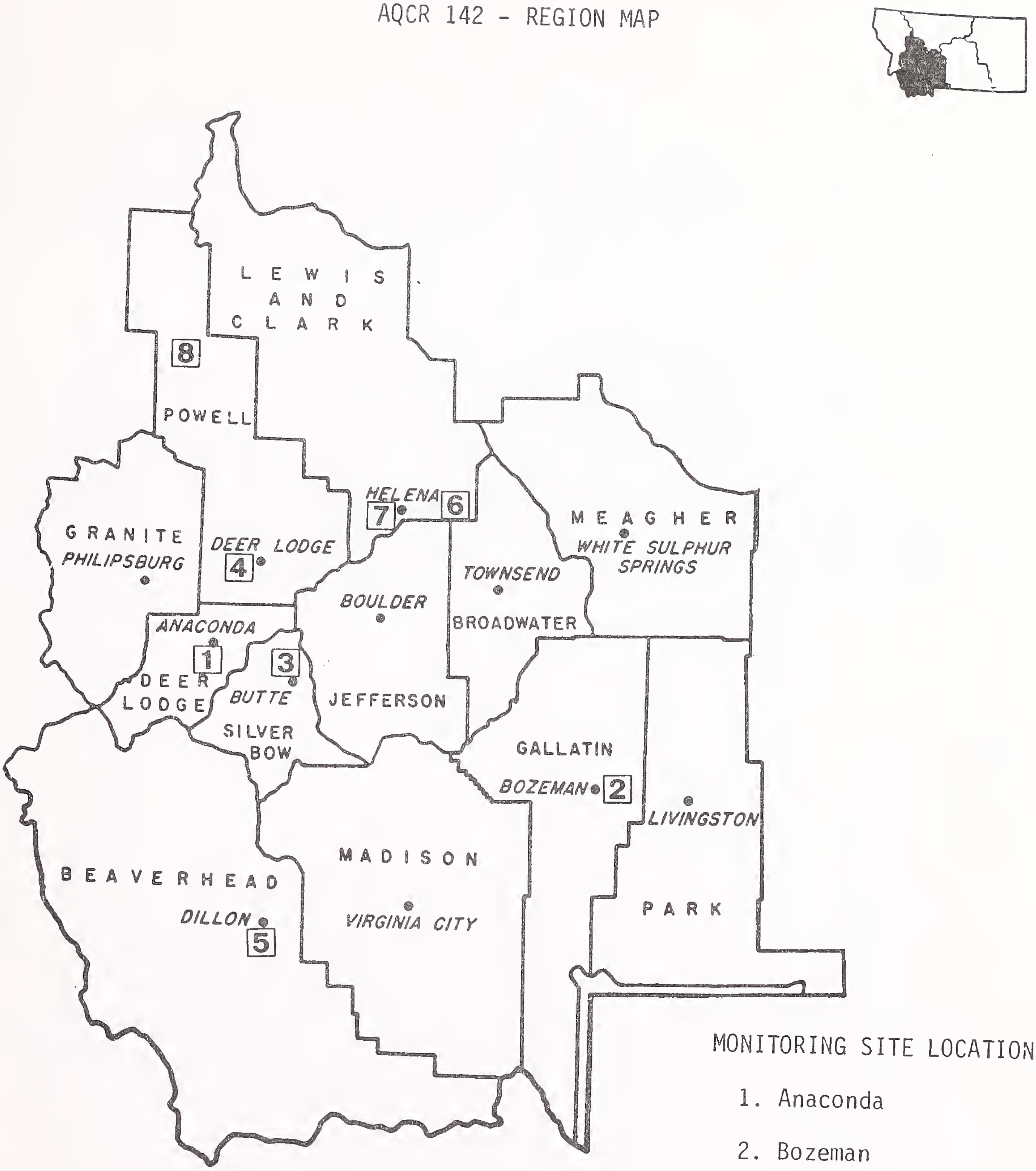
Zinc was analyzed from hi-vol filters at six sites in this region. One of the sites was collocated. The maximum 24-hour observation was 12.43 ug/m$^3$ at the Hadfield site in East Helena. There is no air pollution standard for zinc. Table 27 summarizes the zinc data for this region.

## Respirable Particulates (PM10)

Particulate matter less than 10 microns (PM10) was monitored at five sites in this region in 1985. One of the sites was collocated. The maximum 24-hour observation was 302 ug/$m^3$ at the Greeley School site in Butte. There is no current standard for PM10 but EPA plans to propose one in 1987. PM10 gives an indication of the respirable portion of TSP concentrations. Table 28 summarizes the PM10 data for this region.

FIGURE 3

AQCR 142 - REGION MAP


LEWIS AND CLARK
8
POWELL
GRANITE
PHILIPSBURG
DEER LODGE
4
HELENA
7
6
MEAGHER
WHITE SULPHUR SPRINGS
TOWNSEND
BROADWATER
BOULDER
ANACONDA
1
3
DEER LODGE
BUTTE
SILVER BOW
JEFFERSON
GALLATIN
BOZEMAN
2
LIVINGSTON
PARK
BEAVERHEAD
DILLON
5
MADISON
VIRGINIA CITY

MONITORING SITE LOCATIONS

1. Anaconda
2. Bozeman
3. Butte
4. Deer Lodge
5. Dillon
6. East Helena
7. Helena
8. Ovando

## TABLE 16a
## AQCR 142 - MONITORING SITE DESCRIPTIONS

| AREA/SITE CODE | SITE NAME/ADDRESS<br>SUPPORTING AGENCY | STATION TYPE<br>PROJECT DESCRIPTION | CITY<br>COUNTY |
|---|---|---|---|
| 0020 007 F 01 | LINCOLN SCHOOL, CEDAR STREET<br>MONTANA AIR QUALITY BUREAU | SUBURBAN-RESIDENTIAL<br>POPULATION ORIENTED | ANACONDA<br>DEER LODGE |
| 0120 002 F 01 | EAST MAIN CITY BUILDING<br>MONTANA AIR QUALITY BUREAU | CITY CENTER-COMMERCIAL<br>POPULATION ORIENTED | BOZEMAN<br>GALLATIN |
| 0120 005 F 01 | WHITTIER SCHOOL, 515 N 5TH AVENUE<br>MONTANA AIR QUALITY BUREAU | SUBURBAN-RESIDENTIAL<br>POPULATION ORIENTED | BOZEMAN<br>GALLATIN |
| 0120 007 F 01 | SOURDOUGH CREEK, 211 EAST MASON STREET<br>MONTANA AIR QUALITY BUREAU | SUBURBAN-RESIDENTIAL<br>POPULATION ORIENTED | BOZEMAN<br>GALLATIN |
| 0160 005 F 01 | GREELEY SCHOOL #1, SILVER BOW BLVD<br>MONTANA AIR QUALITY BUREAU | CITY CENTER-RESIDENTIAL<br>POPULATION ORIENTED | BUTTE<br>SILVER BOW |
| 0380 001 F 01 | POWELL COUNTY COURTHOUSE, MISSOURI STREET<br>MONTANA AIR QUALITY BUREAU | CITY CENTER-COMMERCIAL<br>POPULATION ORIENTED | DEER LODGE<br>POWELL |
| 0400 004 F 02 | HIWAY JUNCTION, EAST OF ANACONDA<br>MONTANA AIR QUALITY BUREAU | RURAL-AGRICULTURAL<br>SOURCE ORIENTED | DEER LODGE |
| 0420 001 F 01 | BEAVERHEAD CO COURTHOUSE ROOF, TENDOY ST<br>MONTANA AIR QUALITY BUREAU | CITY CENTER-COMMERCIAL<br>POPULATION ORIENTED | DILLON<br>BEAVERHEAD |
| 0720 001 F 01 | COGSWELL BLDG #1 - LOCKEY AV & ROBERTS ST<br>MONTANA AIR QUALITY BUREAU | CITY CENTER-RESIDENTIAL<br>POPULATION ORIENTED | HELENA<br>LEWIS & CLARK |
| 0720 001 F 07 | COGSWELL BLDG, COLOCATED HIVOL<br>MONTANA AIR QUALITY BUREAU | CITY CENTER-RESIDENTIAL<br>QA-COLOCATED SAMPLER | HELENA<br>LEWIS & CLARK |
| 0720 013 G 05 | CAPITAL COURTS - 1013 DEARBORN AVE<br>MONTANA AIR QUALITY BUREAU | SUBURBAN-COMMERCIAL<br>SPECIAL STUDIES | HELENA<br>LEWIS & CLARK |
| 0720 016 G 05 | COONEY HOME - 3404 COONEY DRIVE<br>MONTANA AIR QUALITY BUREAU | SUBURBAN-RESIDENTIAL<br>SPECIAL STUDIES | HELENA<br>LEWIS & CLARK |
| 0760 905 F 05 | MONTANA CITY SCHOOL<br>MONTANA AIR QUALITY BUREAU | CITY CENTER-RESIDENTIAL<br>SPECIAL STUDIES | MONTANA CITY<br>JEFFERSON |
| 0860 002 F 02 | HASTIE RESIDENCE - 212 PACIFIC ST<br>MONTANA AIR QUALITY BUREAU | SUBURBAN-INDUSTRIAL<br>SOURCE ORIENTED | EAST HELENA<br>LEWIS & CLARK |
| 0860 009 F 01 | 1065 PHILLIPS LANE<br>MONTANA AIR QUALITY BUREAU | SUBURBAN-RESIDENTIAL<br>POPULATION ORIENTED | HELENA<br>LEWIS & CLARK |
| 0860 714 F 02 | FIREHALL - 2 EAST PACIFIC ST<br>MONTANA AIR QUALITY BUREAU | CITY CENTER-RESIDENTIAL<br>SOURCE ORIENTED | EAST HELENA<br>LEWIS & CLARK |

## TABLE 16b
## AQCR 142 - MONITORING SITE DESCRIPTIONS

| AREA/SITE CODE | SITE NAME/ADDRESS<br>SUPPORTING AGENCY | STATION TYPE<br>PROJECT DESCRIPTION | CITY<br>COUNTY |
|---|---|---|---|
| 0860 716 F 02 | SOUTH - 3/4 MI S OF E HELENA - KLEF FIELD<br>MONTANA AIR QUALITY BUREAU | SUBURBAN-INDUSTRIAL<br>SOURCE ORIENTED | EAST HELENA<br>LEWIS & CLARK |
| 0860 719 F 02 | HADFIELD - 101 WEST MAIN<br>MONTANA AIR QUALITY BUREAU | SUBURBAN-INDUSTRIAL<br>SOURCE ORIENTED | EAST HELENA<br>LEWIS & CLARK |
| 0860 719 F 07 | HADFIELD - COLOCATED<br>MONTANA AIR QUALITY BUREAU | SUBURBAN-INDUSTRIAL<br>QA-COLOCATED SAMPLER | EAST HELENA<br>LEWIS & CLARK |
| 0860 724 F 02 | DARTMAN FIELD - N OF EAST HELENA<br>MONTANA AIR QUALITY BUREAU | RURAL-AGRICULTURAL<br>SOURCE ORIENTED | EAST HELENA<br>LEWIS & CLARK |
| 1260 024 F 03 | TERRY SMITH RANCH - 5 MI E OF OVANDO<br>MONTANA AIR QUALITY BUREAU | RURAL-AGRICULTURAL<br>BACKGROUND | OVANDO<br>POWELL |

## TABLE 17a
## AQCR 142 - TOTAL SUSPENDED PARTICULATES
Micrograms per Cubic Meter

| County/City Site Code | Site Name/Location | Yr | Num Obs | Max Obs | 2nd Max | 3rd Max | Arith Mean | Geom Mean |
|---|---|---|---|---|---|---|---|---|
| Beaverhead/Dillon | | | | | | | | |
| 0420 001 F 01 | Beaverhead Co. Courthouse | 84 | 14 | 57 | 54 | 50 | 39.3 | 38.1 |
| | | 85 | 56 | 112 | 97 | 94 | 48.7 | 44.7 |
| Deer Lodge/Anaconda | | | | | | | | |
| 0020 007 F 01 | Lincoln School | 82 | 58 | 128 | 125 | 89 | 40.6 | 24.4 |
| | | 83 | 60 | 123 | 121 | 115 | 43.0 | 36.4 |
| | | 84 | 54 | 210 | 145 | 132 | 42.4 | 34.7 |
| | | 85 | 60 | 245 | 167 | 159 | 58.2 | 46.2 |
| 0400 004 F 02 | Hiway Junction | 84 | 53 | 825 | 480 | 235 | 61.3 | 29.9 |
| | | 85 | 113 | 151 | 73 | 72 | 28.3 | 22.7 |
| Gallatin/Bozeman | | | | | | | | |
| 0120 002 F 01 | East Main City Building | 82 | 52 | 265 | 180 | 148 | 67.4 | 56.6 |
| | | 83 | 46 | 137 | 136 | 127 | 67.7 | 59.1 |
| | | 84 | 30 | 198 | 179 | 174 | 81.1 | 68.8 |
| | | 85 | 43 | 202 | 153 | 151 | 64.7 | 55.7 |
| 0120 005 F 01 | Whittier School | 82 | 56 | 143 | 125 | 124 | 52.9 | 47.3 |
| | | 83 | 56 | 118 | 114 | 107 | 52.6 | 47.2 |
| | | 84 | 45 | 202 | 157 | 152 | 67.4 | 57.1 |
| | | 85 | 24 | 176 | 150 | 125 | 65.6 | 56.6 |
| 0120 007 F 01 | Christie Fields | 85 | 25 | 62 | 61 | 50 | 33.2 | 29.6 |

## TABLE 17b
## AQCR 142 - TOTAL SUSPENDED PARTICULATES
Micrograms per Cubic Meter

| County/City Site Code | Site Name/Location | Yr | Num Obs | Max Obs | 2nd Max | 3rd Max | Arith Mean | Geom Mean |
|---|---|---|---|---|---|---|---|---|
| Jefferson/Montana City | | | | | | | | |
| 0760 905 F 05 | Montana City School | 82 | 18 | 188 | 182 | 154 | 86.8 | 73.5 |
| | | 83 | 35 | 193 | 175 | 165 | 80.6 | 68.0 |
| | | 84 | 40 | 349 | 201 | 196 | 97.9 | 78.4 |
| | | 85 | 60 | 259 | 228 | 221 | 78.5 | 62.5 |
| Lewis and Clark/Helena | | | | | | | | |
| 0720 001 F 01 | Cogswell Building | 82 | 37 | 114 | 113 | 91 | 49.2 | 42.3 |
| | | 83 | 55 | 193 | 165 | 137 | 48.6 | 41.0 |
| | | 84 | 57 | 248 | 120 | 114 | 50.9 | 42.0 |
| | | 85 | 58 | 273 | 195 | 189 | 60.5 | 45.8 |
| 0720 013 G 05 | Capital Courts | 82 | 54 | 183 | 166 | 122 | 58.6 | 51.3 |
| | | 83 | 59 | 232 | 212 | 178 | 72.8 | 58.6 |
| | | 84 | 54 | 122 | 116 | 111 | 52.8 | 45.7 |
| | | 85 | 60 | 397 | 213 | 210 | 67.4 | 50.7 |
| 0720 016 G 05 | Cooney Home | 82 | 11 | 75 | 70 | 46 | 36.0 | 30.9 |
| | | 83 | 61 | 147 | 128 | 83 | 39.6 | 33.9 |
| | | 84 | 50 | 98 | 79 | 74 | 39.0 | 33.0 |
| | | 85 | 37 | 76 | 69 | 65 | 35.8 | 30.0 |
| Lewis and Clark/East Helena | | | | | | | | |
| 0860 002 F 02 | Hastie Residence | 82 | 26 | 102 | 101 | 94 | 60.8 | 56.1 |
| | | 83 | 68 | 135 | 132 | 126 | 58.3 | 52.8 |
| | | 84 | 107 | 141 | 115 | 114 | 57.0 | 51.5 |
| | | 85 | 109 | 173 | 130 | 111 | 56.0 | 49.3 |

# TABLE 17c
## AQCR 142 - TOTAL SUSPENDED PARTICULATES
Micrograms per Cubic Meter

| County/City Site Code | Site Name/Location | Yr | Num Obs | Max Obs | 2nd Max | 3rd Max | Arith Mean | Geom Mean |
|---|---|---|---|---|---|---|---|---|
| Lewis and Clark/East Helena | | | | | | | | |
| 0860 714 F 02 | Firehall | 83 | 51 | 142 | 136 | 131 | 72.1 | 65.5 |
| | | 84 | 115 | 216 | 206 | 196 | 75.2 | 65.5 |
| | | 85 | 115 | 215 | 207 | 170 | 67.9 | 59.2 |
| 0860 716 F 02 | South | 82 | 28 | 88 | 80 | 71 | 43.1 | 38.0 |
| | | 83 | 58 | 90 | 76 | 72 | 34.6 | 30.8 |
| | | 84 | 60 | 98 | 94 | 85 | 41.2 | 34.2 |
| | | 85 | 17 | 92 | 63 | 62 | 36.4 | 30.8 |
| 0860 719 F 02 | Hadfield | 82 | 25 | 133 | 121 | 113 | 66.7 | 60.8 |
| | | 83 | 67 | 240 | 232 | 172 | 74.2 | 65.5 |
| | | 84 | 116 | 326 | 301 | 273 | 85.6 | 70.2 |
| | | 85 | 115 | 273 | 189 | 173 | 68.6 | 59.4 |
| 0860 719 F 07 | Hadfield - Collocated | 82 | 30 | 130 | 126 | 122 | 72.1 | 66.3 |
| | | 83 | 64 | 239 | 212 | 192 | 75.6 | 66.7 |
| | | 84 | 109 | 295 | 268 | 259 | 79.4 | 64.6 |
| | | 85 | 115 | 250 | 182 | 162 | 66.6 | 58.2 |
| 0860 724 F 02 | Dartman Field | 83 | 42 | 98 | 95 | 93 | 46.9 | 40.1 |
| | | 84 | 59 | 174 | 114 | 109 | 50.0 | 40.5 |
| | | 85 | 58 | 113 | 106 | 101 | 44.0 | 36.4 |
| Powell/Deer Lodge | | | | | | | | |
| 0380 001 F 01 | Powell County Courthouse | 84 | 19 | 109 | 87 | 76 | 48.8 | 42.5 |
| | | 85 | 53 | 130 | 119 | 109 | 51.6 | 42.0 |

## TABLE 17d
## AQCR 142 - TOTAL SUSPENDED PARTICULATES
Micrograms per Cubic Meter

| County/City Site Code | Site Name/Location | Yr | Num Obs | Max Obs | 2nd Max | 3rd Max | Arith Mean | Geom Mean |
|---|---|---|---|---|---|---|---|---|
| Powell/Ovando | | | | | | | | |
| 1260 024 F 03 | Terry Smith Ranch | 82 | 56 | 79 | 79 | 64 | 20.5 | 14.1 |
| | | 83 | 53 | 68 | 57 | 54 | 17.0 | 12.2 |
| | | 84 | 47 | 231 | 145 | 97 | 27.8 | 14.8 |
| | | 85 | 56 | 104 | 95 | 72 | 21.5 | 15.0 |
| Silver Bow/Butte | | | | | | | | |
| 0160 005 F 01 | Greeley School | 82 | 46 | 225 | 216 | 187 | 70.6 | 57.9 |
| | | 83 | 56 | 229 | 224 | 206 | 64.4 | 50.1 |
| | | 84 | 34 | 193 | 180 | 129 | 53.3 | 42.7 |
| | | 85 | 39 | 314 | 308 | 257 | 82.9 | 55.0 |

## TABLE 18a
## AQCR 142 - TSP - Number of Exceedances
Micrograms per Cubic Meter

| County/City<br>Site Code | Site Name/Location | Yr | Num Obs | Federal Prim Daily 260 | Federal Prim Annual G 75 | Federal Sec Daily 150 | Federal Sec Annual G 60 | Montana Std Daily 200 | Montana Std Annual A 75 |
|---|---|---|---|---|---|---|---|---|---|
| Beaverhead/Dillon | | | | | | | | | |
| 0420 001 F 01 | Beaverhead Co. Courthouse | 85 | 56 | 0 | 0 | 0 | 0 | 0 | 0 |
| Deer Lodge/Anaconda | | | | | | | | | |
| 0020 007 F 01 | Lincoln School | 85 | 60 | 0 | 0 | 3 | 0 | 1 | 0 |
| 0400 004 F 02 | Hiway Junction | 85 | 113 | 0 | 0 | 1 | 0 | 0 | 0 |
| Gallatin/Bozeman | | | | | | | | | |
| 0120 002 F 01 | East Main City Building | 85 | 43 | 0 | 0 | 3 | 0 | 1 | 0 |
| 0120 005 F 01 | Whittier School | 85 | 24 | 0 | 0 | 2 | 0 | 0 | 0 |
| 0120 007 F 01 | Christie Fields | 85 | 25 | 0 | 0 | 0 | 0 | 0 | 0 |
| Jefferson/Montana City | | | | | | | | | |
| 0760 905 F 05 | Montana City School | 85 | 60 | 0 | 0 | 5 | 1 | 3 | 1 |
| Lewis and Clark/Helena | | | | | | | | | |
| 0720 001 F 01 | Cogswell Building | 85 | 58 | 1 | 0 | 4 | 0 | 1 | 0 |
| 0720 013 G 05 | Capital Courts | 85 | 60 | 1 | 0 | 6 | 0 | 3 | 0 |
| 0720 016 G 05 | Cooney Home | 85 | 37 | 0 | 0 | 0 | 0 | 0 | 0 |

## TABLE 18b
## AQCR 142 - TSP - Number of Exceedances
Micrograms per Cubic Meter

| County/City Site Code | Site Name/Location | Yr | Num Obs | Federal Prim Daily 260 | Federal Prim Annual G 75 | Federal Sec Daily 150 | Federal Sec Annual G 60 | Montana Std Daily 200 | Montana Std Annual A 75 |
|---|---|---|---|---|---|---|---|---|---|
| Lewis and Clark/East Helena | | | | | | | | | |
| 0860 002 F 02 | Hastie Residence | 85 | 109 | 0 | 0 | 1 | 0 | 0 | 0 |
| 0860 714 F 02 | Firehall | 85 | 115 | 0 | 0 | 5 | 0 | 2 | 0 |
| 0860 716 F 02 | South | 85 | 17 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0860 719 F 02 | Hadfield | 85 | 115 | 1 | 0 | 5 | 0 | 1 | 0 |
| 0860 724 F 02 | Dartman Field | 85 | 58 | 0 | 0 | 0 | 0 | 0 | 0 |
| Powell/Deer Lodge | | | | | | | | | |
| 0380 001 F 01 | Powell County Courthouse | 85 | 53 | 0 | 0 | 0 | 0 | 0 | 0 |
| Powell/Ovando | | | | | | | | | |
| 1260 024 F 03 | Terry Smith Ranch | 85 | 56 | 0 | 0 | 0 | 0 | 0 | 0 |
| Silver Bow/Butte | | | | | | | | | |
| 0160 005 F 01 | Greeley School | 85 | 39 | 2 | 0 | 7 | 0 | 5 | 1 |

TABLE 19
AQCR 142 - ALUMINUM
Micrograms per Cubic Meter

| County/City<br>Site Code | Site Name/Location | Yr | Num Obs | Max Obs | 2nd Max | 3rd Max | Arith Mean |
|---|---|---|---|---|---|---|---|
| Deer Lodge/Anaconda | | | | | | | |
| 0400 004 F 02 | Hiway Junction | 84 | 53 | 7.03 | 5.03 | 3.41 | 0.74 |
| | | 85 | 24 | .56 | .53 | .51 | 0.24 |

# TABLE 20a
## AQCR 142 - ARSENIC
Micrograms per Cubic Meter

| County/City Site Code | Site Name/Location | Yr | Num Obs | Max Obs | 2nd Max | 3rd Max | Arith Mean |
|---|---|---|---|---|---|---|---|
| Deer Lodge/Anaconda | | | | | | | |
| 0020 007 F 01 | Lincoln School | 85 | 45 | .232 | .167 | .100 | .021 |
| 0400 004 F 02 | Hiway Junction | 84 | 53 | 2.011 | 1.842 | 1.127 | .170 |
| | | 85 | 113 | .349 | .264 | .259 | .040 |
| Lewis and Clark/East Helena | | | | | | | |
| 0860 002 F 02 | Hastie Residence | 82 | 14 | .510 | .463 | .444 | .232 |
| | | 83 | 82 | 1.015 | .804 | .728 | .239 |
| | | 84 | 107 | .820 | .620 | .557 | .195 |
| | | 85 | 26 | .372 | .328 | .257 | .129 |
| 0860 714 F 02 | Firehall | 83 | 55 | 1.836 | 1.311 | 1.270 | .551 |
| | | 84 | 115 | 1.657 | 1.504 | 1.378 | .416 |
| | | 85 | 29 | 2.710 | .869 | .798 | .421 |
| 0860 716 F 02 | South | 82 | 11 | .256 | .171 | .143 | .090 |
| | | 83 | 67 | .424 | .374 | .331 | .113 |
| | | 84 | 60 | .341 | .298 | .244 | .097 |
| | | 85 | 15 | .399 | .280 | .242 | .116 |
| 0860 719 F 02 | Hadfield | 82 | 14 | .688 | .340 | .339 | .207 |
| | | 83 | 70 | 1.208 | 1.175 | .957 | .333 |
| | | 84 | 116 | 1.359 | .847 | .821 | .261 |
| | | 85 | 30 | .524 | .495 | .450 | .205 |
| 0860 719 F 07 | Hadfield - Collocated | 82 | 15 | .748 | .445 | .440 | .231 |
| | | 83 | 67 | 1.263 | 1.066 | .906 | .336 |
| | | 84 | 109 | 1.142 | .927 | .923 | .242 |
| | | 85 | 29 | .592 | .494 | .463 | .195 |

### TABLE 20b
### AQCR 142 - ARSENIC
Micrograms per Cubic Meter

| County/City<br>Site Code | Site Name/Location | Yr | Num Obs | Max Obs | 2nd Max | 3rd Max | Arith Mean |
|---|---|---|---|---|---|---|---|
| Lewis and Clark/East Helena | | | | | | | |
| 0860 724 F 02 | Dartman Field | 83 | 42 | 1.184 | .925 | .751 | .321 |
| | | 84 | 59 | .934 | .729 | .594 | .206 |
| | | 85 | 14 | .413 | .338 | .315 | .152 |

## TABLE 21a
## AQCR 142 - CADMIUM
Micrograms per Cubic Meter

| County/City<br>Site Code | Site Name/Location | Yr | Num Obs | Max Obs | 2nd Max | 3rd Max | Arith Mean |
|---|---|---|---|---|---|---|---|
| Deer Lodge/Anaconda | | | | | | | |
| 0400 004 F 02 | Hiway Junction | 84 | 53 | .055 | .053 | .017 | .004 |
| | | 85 | 24 | .011 | .007 | .007 | .002 |
| Lewis and Clark/East Helena | | | | | | | |
| 0860 002 F 02 | Hastie Residence | 82 | 14 | 1.230 | .359 | .261 | .188 |
| | | 83 | 82 | 2.760 | .449 | .433 | .142 |
| | | 84 | 107 | .840 | .676 | .663 | .117 |
| | | 85 | 26 | .540 | .388 | .181 | .092 |
| 0860 714 F 02 | Firehall | 83 | 55 | 1.176 | 1.161 | .914 | .296 |
| | | 84 | 115 | 1.661 | 1.098 | 1.005 | .250 |
| | | 85 | 29 | .513 | .491 | .467 | .186 |
| 0860 716 F 02 | South | 82 | 11 | .156 | .062 | .060 | .040 |
| | | 83 | 67 | .211 | .209 | .189 | .048 |
| | | 84 | 60 | .862 | .682 | .179 | .065 |
| | | 85 | 15 | .198 | .146 | .138 | .073 |
| 0860 719 F 02 | Hadfield | 82 | 14 | .270 | .244 | .198 | .097 |
| | | 83 | 70 | 1.676 | .975 | .784 | .194 |
| | | 84 | 116 | 1.695 | .919 | .858 | .193 |
| | | 85 | 30 | .436 | .374 | .330 | .134 |
| 0860 719 F 07 | Hadfield - Collocated | 82 | 15 | .319 | .256 | .207 | .100 |
| | | 83 | 67 | 1.691 | .702 | .514 | .178 |
| | | 84 | 109 | 1.595 | 1.118 | .785 | .181 |
| | | 85 | 29 | .490 | .388 | .318 | .134 |

## TABLE 21b
## AQCR 142 - CADMIUM
Micrograms per Cubic Meter

| County/City Site Code | Site Name/Location | Yr | Num Obs | Max Obs | 2nd Max | 3rd Max | Arith Mean |
|---|---|---|---|---|---|---|---|
| Lewis and Clark/East Helena | | | | | | | |
| 0860 724 F 02 | Dartman Field | 83 | 42 | .698 | .548 | .477 | .153 |
| | | 84 | 59 | 1.127 | .540 | .471 | .137 |
| | | 85 | 14 | .261 | .181 | .177 | .084 |

## TABLE 22
## AQCR 142 - CHROMIUM
Micrograms/Cubic Meter

| County/City Site Code | Site Name/Location | Yr | Num Obs | Max Obs | 2nd Max | 3rd Max | Arith Mean |
|---|---|---|---|---|---|---|---|
| Deer Lodge/Anaconda | | | | | | | |
| 0400 004 F 02 | Hiway Junction | 84 | 53 | .03 | .02 | .01 | .00 |
| | | 85 | 24 | .12 | .00 | .00 | .00 |

## TABLE 23a
## AQCR 142 - COPPER
Micrograms per Cubic Meter

| County/City Site Code | Site Name/Location | Yr | Num Obs | Max Obs | 2nd Max | 3rd Max | Arith Mean |
|---|---|---|---|---|---|---|---|
| Deer Lodge/Anaconda | | | | | | | |
| 0400 004 F 02 | Hiway Junction | 84 | 53 | 6.83 | 6.19 | 2.25 | .48 |
| | | 85 | 24 | 1.57 | 1.28 | .38 | .26 |
| Lewis and Clark/East Helena | | | | | | | |
| 0860 002 F 02 | Hastie Residence | 82 | 14 | 9.75 | 4.72 | 3.02 | 2.06 |
| | | 83 | 82 | 5.37 | 5.25 | 4.71 | 1.37 |
| | | 84 | 107 | 18.24 | 8.19 | 6.61 | 1.64 |
| | | 85 | 29 | 10.88 | 9.07 | 7.11 | 1.89 |
| 0860 714 F 02 | Firehall | 83 | 55 | 32.95 | 23.71 | 23.46 | 6.44 |
| | | 84 | 115 | 86.07 | 45.49 | 33.68 | 7.25 |
| | | 85 | 115 | 64.52 | 49.08 | 36.65 | 5.88 |
| 0860 716 F 02 | South | 82 | 11 | 1.13 | .52 | .44 | .40 |
| | | 83 | 67 | .99 | .97 | .96 | .46 |
| | | 84 | 60 | 2.95 | 1.39 | .99 | .41 |
| | | 85 | 15 | 1.22 | 1.02 | .63 | .50 |
| 0860 719 F 02 | Hadfield | 82 | 14 | 10.41 | 3.65 | 2.70 | 2.05 |
| | | 83 | 70 | 16.50 | 12.86 | 12.06 | 3.29 |
| | | 84 | 116 | 102.90 | 29.05 | 14.62 | 3.90 |
| | | 85 | 33 | 14.05 | 8.61 | 7.82 | 3.52 |
| 0860 719 F 07 | Hadfield - Collocated | 82 | 15 | 4.43 | 4.29 | 3.49 | 1.92 |
| | | 83 | 67 | 22.67 | 14.47 | 13.28 | 3.74 |
| | | 84 | 109 | 84.68 | 32.16 | 17.82 | 3.95 |
| | | 85 | 32 | 14.28 | 8.98 | 7.82 | 3.48 |

## TABLE 23b
## AQCR 142 - COPPER
Micrograms per Cubic Meter

| County/City<br>Site Code | Site Name/Location | Yr | Num Obs | Max Obs | 2nd Max | 3rd Max | Arith Mean |
|---|---|---|---|---|---|---|---|
| Lewis and Clark/East Helena | | | | | | | |
| 0860 724 F 02 | Dartman Field | 83 | 42 | 32.19 | 8.23 | 6.91 | 2.61 |
| | | 84 | 59 | 35.92 | 7.45 | 4.90 | 1.91 |
| | | 85 | 15 | 8.09 | 5.02 | 4.20 | 1.93 |

## TABLE 24a
## AQCR 142 - LEAD - DAILY
Micrograms per Cubic Meter

| County/City Site Code | Site Name/Location | Yr | Num Obs | Max Obs | 2nd Max | 3rd Max | Arith Mean |
|---|---|---|---|---|---|---|---|
| Deer Lodge/Anaconda | | | | | | | |
| 0020 007 F 01 | Lincoln School | 82 | 58 | .31 | .14 | .11 | .04 |
| | | 83 | 60 | .17 | .10 | .10 | .04 |
| | | 84 | 54 | .13 | .09 | .09 | .02 |
| | | 85 | 15 | .12 | .11 | .07 | .03 |
| 0400 004 F 02 | Hiway Junction | 84 | 53 | 1.22 | .99 | .44 | .09 |
| | | 85 | 24 | .47 | .14 | .11 | .05 |
| Jefferson/Montana City | | | | | | | |
| 0760 905 F 05 | Montana City School | 82 | 13 | .41 | .33 | .25 | .14 |
| | | 83 | 17 | .87 | .67 | .50 | .23 |
| | | 84 | 39 | .76 | .51 | .41 | .13 |
| | | 85 | 60 | .73 | .68 | .67 | .09 |
| Lewis and Clark/East Helena | | | | | | | |
| 0860 002 F 02 | Hastie Residence | 82 | 26 | 5.20 | 4.08 | 4.07 | 2.17 |
| | | 83 | 82 | 10.01 | 9.09 | 6.31 | 2.91 |
| | | 84 | 107 | 12.89 | 11.09 | 10.25 | 2.88 |
| | | 85 | 109 | 7.64 | 6.72 | 6.54 | 1.87 |
| 0860 714 F 02 | Firehall | 83 | 55 | 16.75 | 13.13 | 12.73 | 5.04 |
| | | 84 | 115 | 19.27 | 17.12 | 17.07 | 5.28 |
| | | 85 | 115 | 17.08 | 12.99 | 12.98 | 3.34 |
| 0860 716 F 02 | South | 82 | 28 | 4.28 | 3.45 | 2.95 | 1.29 |
| | | 83 | 67 | 3.36 | 3.24 | 3.16 | .99 |
| | | 84 | 60 | 7.11 | 5.53 | 3.85 | 1.27 |
| | | 85 | 17 | 5.09 | 3.69 | 3.37 | 1.60 |

## TABLE 24b
## AQCR 142 - LEAD - DAILY
Micrograms per Cubic Meter

| County/City<br>Site Code | Site Name/Location | Yr | Num Obs | Max Obs | 2nd Max | 3rd Max | Arith Mean |
|---|---|---|---|---|---|---|---|
| Lewis and Clark/East Helena | | | | | | | |
| 0860 719 F 02 | Hadfield | 82 | 25 | 7.62 | 6.18 | 4.29 | 2.34 |
| | | 83 | 70 | 8.39 | 7.29 | 7.21 | 3.09 |
| | | 84 | 116 | 17.73 | 12.88 | 12.79 | 3.48 |
| | | 85 | 115 | 10.08 | 9.05 | 7.59 | 2.18 |
| 0860 719 F 07 | Hadfield - Collocated | 82 | 30 | 7.34 | 6.55 | 5.61 | 2.55 |
| | | 83 | 67 | 9.28 | 7.86 | 7.19 | 3.08 |
| | | 84 | 109 | 20.43 | 12.58 | 12.03 | 3.23 |
| | | 85 | 115 | 8.50 | 8.29 | 6.79 | 2.03 |
| 0860 724 F 02 | Dartman Field | 83 | 42 | 9.80 | 7.99 | 7.46 | 2.76 |
| | | 84 | 59 | 10.96 | 8.34 | 7.85 | 2.69 |
| | | 85 | 58 | 7.14 | 6.74 | 4.46 | 1.51 |

## TABLE 25a
## AQCR 142 - LEAD--QUARTERLY
Micrograms per Cubic Meter

| County/City Site Code | Site Name/Location | Yr | Jan-Mar Num Obs | Jan-Mar Arith Mean | Apr-Jun Num Obs | Apr-Jun Arith Mean | Jul-Sep Num Obs | Jul-Sep Arith Mean | Oct-Dec Num Obs | Oct-Dec Arith Mean |
|---|---|---|---|---|---|---|---|---|---|---|
| Deer Lodge/Anaconda | | | | | | | | | | |
| 0020 007 F 01 | Lincoln School | 82 | 13 | .02 | 15 | .04 | 15 | .04 | 15 | .07 |
| | | 83 | 15 | .04 | 15 | .04 | 15 | .04 | 15 | .05 |
| | | 84 | 12 | .04 | 13 | .00 | 15 | .02 | 15 | .02 |
| | | 85 | 15 | .03 | 1 | .03 | -- | -- | -- | -- |
| 0400 004 F 02 | Hiway Junction | 84 | -- | -- | -- | -- | 25 | .03 | 28 | .14 |
| | | 85 | 23 | .05 | 1 | .03 | -- | -- | -- | -- |
| Jefferson/Montana City | | | | | | | | | | |
| 0760 905 F 05 | Montana City School | 82 | 2 | .28 | 1 | .13 | 10 | .12 | -- | --- |
| | | 83 | -- | --- | -- | --- | 7 | .17 | 10 | .28 |
| | | 84 | 4 | .06 | 5 | .01 | 15 | .09 | 15 | .22 |
| | | 85 | 14 | .21 | 16 | .03 | 15 | .03 | 15 | .09 |
| Lewis & Clark/East Helena | | | | | | | | | | |
| 0860 002 F 02 | Hastie Residence | 82 | 1 | 1.94 | 1 | 1.46 | 9 | 2.18 | 15 | 2.23 |
| | | 83 | 15 | 3.11 | 14 | 2.51 | 24 | 2.93 | 29 | 3.00 |
| | | 84 | 29 | 3.26 | 26 | 1.71 | 26 | 2.66 | 26 | 3.86 |
| | | 85 | 26 | 2.31 | 29 | 1.99 | 25 | 1.42 | 29 | 1.75 |
| 0860 714 F 02 | Firehall | 83 | -- | --- | -- | --- | 25 | 4.78 | 30 | 5.25 |
| | | 84 | 30 | 5.77 | 27 | 2.74 | 29 | 5.61 | 29 | 6.82 |
| | | 85 | 29 | 5.46 | 31 | 3.29 | 25 | 2.25 | 30 | 2.26 |

## TABLE 25b
## AQCR 142 - LEAD--QUARTERLY
Micrograms per Cubic Meter

| County/City Site Code | Site Name/Location | Yr | Jan-Mar Num Obs | Jan-Mar Arith Mean | Apr-Jun Num Obs | Apr-Jun Arith Mean | Jul-Sep Num Obs | Jul-Sep Arith Mean | Oct-Dec Num Obs | Oct-Dec Arith Mean |
|---|---|---|---|---|---|---|---|---|---|---|
| Lewis and Clark/East Helena | | | | | | | | | | |
| 0860 716 F 02 | South | 82 | 1 | 1.81 | 2 | 2.02 | 13 | 1.52 | 12 | .89 |
| | | 83 | 11 | .95 | 13 | 1.07 | 27 | .78 | 16 | 1.31 |
| | | 84 | 15 | 1.47 | 15 | 1.21 | 15 | 0.98 | 15 | 1.43 |
| | | 85 | 14 | 1.85 | 3 | .46 | -- | --- | -- | --- |
| 0860 719 F 02 | Hadfield | 82 | 1 | 7.62 | 2 | 1.59 | 7 | 2.63 | 15 | 1.95 |
| | | 83 | 15 | 3.27 | 2 | 3.20 | 24 | 3.00 | 29 | 3.07 |
| | | 84 | 28 | 4.12 | 29 | 1.82 | 30 | 3.38 | 29 | 4.63 |
| | | 85 | 30 | 3.19 | 29 | 2.16 | 28 | 1.86 | 28 | 1.41 |
| 0860 719 F 07 | Hadfield - Collocated | 82 | 1 | 7.34 | 2 | 2.75 | 11 | 2.68 | 16 | 2.14 |
| | | 83 | 15 | 3.47 | 2 | 3.36 | 22 | 2.92 | 28 | 2.98 |
| | | 84 | 25 | 3.18 | 26 | 1.80 | 28 | 3.44 | 30 | 4.31 |
| | | 85 | 29 | 3.05 | 28 | 2.06 | 27 | 1.68 | 31 | 1.36 |
| 0860 724 F 02 | Dartman Field | 83 | -- | --- | 1 | 1.03 | 25 | 2.95 | 16 | 2.57 |
| | | 84 | 16 | 3.19 | 15 | 1.26 | 14 | 3.10 | 14 | 3.23 |
| | | 85 | 13 | 2.72 | 16 | 1.54 | 14 | .61 | 15 | 1.26 |

## TABLE 26
## AQCR 142 - LEAD - NUMBER OF EXCEEDANCES
Micrograms per Cubic Meter

| County/City Site Code | Site Name/Location | Yr | Num Obs | Federal Prim Cal Qtr 1.5 | Montana Std 90-Day 1.5 |
|---|---|---|---|---|---|
| Deer Lodge/Anaconda | | | | | |
| 0020 007 F 01 | Lincoln School | 85 | 15 | 0 | 0 |
| 0400 004 F 02 | Hiway Junction | 85 | 24 | 0 | 0 |
| Jefferson/Montana City | | | | | |
| 0760 905 F 05 | Montana City School | 85 | 60 | 0 | 0 |
| Lewis and Clark/East Helena | | | | | |
| 0860 002 F 02 | Hastie Residence | 85 | 109 | 3 | 3 |
| 0860 714 F 02 | Firehall | 85 | 115 | 4 | 4 |
| 0860 716 F 02 | South | 85 | 17 | 1 | 1 |
| 0860 719 F 02 | Hadfield | 85 | 115 | 3 | 3 |
| 0860 724 F 02 | Dartman Field | 85 | 58 | 2 | 2 |

## TABLE 27a
## AQCR 142 - ZINC
Micrograms per Cubic Meter

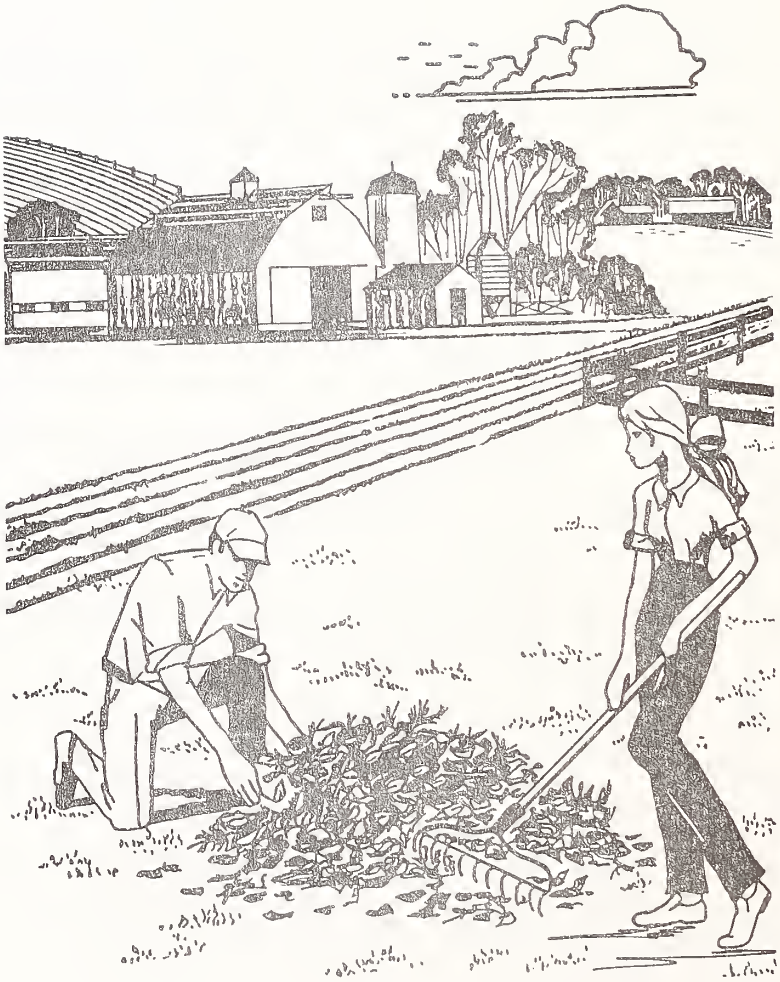
| County/City Site Code | Site Name/Location | Yr | Num Obs | Max Obs | 2nd Max | 3rd Max | Arith Mean |
|---|---|---|---|---|---|---|---|
| Deer Lodge/Anaconda | | | | | | | |
| 0400 004 F 02 | Hiway Junction | 84 | 53 | 8.41 | 4.48 | 1.29 | .43 |
| | | 85 | 24 | .70 | .57 | .39 | .16 |
| Lewis and Clark/East Helena | | | | | | | |
| 0860 002 F 02 | Hastie Residence | 82 | 14 | 1.52 | 1.52 | 1.20 | .84 |
| | | 83 | 82 | 6.49 | 4.60 | 4.34 | 1.47 |
| | | 84 | 107 | 13.29 | 7.04 | 5.00 | 1.97 |
| | | 85 | 29 | 4.72 | 3.95 | 3.05 | 1.77 |
| 0860 714 F 02 | Firehall | 83 | 55 | 6.53 | 6.00 | 4.75 | 1.91 |
| | | 84 | 115 | 16.80 | 12.47 | 10.77 | 3.02 |
| | | 85 | 115 | 6.86 | 5.79 | 4.71 | 1.55 |
| 0860 716 F 02 | South | 82 | 11 | .72 | .69 | .46 | .30 |
| | | 83 | 67 | 2.06 | 1.39 | .99 | .36 |
| | | 84 | 60 | 1.68 | 1.52 | 1.29 | .45 |
| | | 85 | 15 | 1.99 | 1.81 | 1.13 | .64 |
| 0860 719 F 02 | Hadfield | 82 | 14 | 3.06 | 1.97 | 1.02 | .84 |
| | | 83 | 70 | 16.77 | 16.29 | 11.86 | 2.42 |
| | | 84 | 116 | 114.80 | 60.73 | 54.95 | 8.41 |
| | | 85 | 33 | 12.43 | 10.30 | 8.61 | 2.78 |
| 0860 719 F 07 | Hadfield - Collocated | 82 | 15 | 3.21 | 2.25 | 2.19 | .92 |
| | | 83 | 67 | 17.71 | 15.77 | 12.98 | 2.53 |
| | | 84 | 109 | 113.10 | 60.82 | 51.96 | 7.80 |
| | | 85 | 32 | 11.72 | 9.53 | 8.69 | 2.74 |

## TABLE 27b
## AQCR 142 - ZINC
## Micrograms per Cubic Meter

| County/City Site Code | Site Name/Location | Yr | Num Obs | Max Obs | 2nd Max | 3rd Max | Arith Mean |
|---|---|---|---|---|---|---|---|
| Lewis and Clark/East Helena | | | | | | | |
| 0860 724 F 02 | Dartman Field | 83 | 42 | 5.42 | 3.04 | 2.71 | 1.11 |
| | | 84 | 59 | 9.86 | 6.89 | 5.30 | 1.78 |
| | | 85 | 15 | 3.65 | 2.20 | 2.14 | 1.22 |

## TABLE 23
## AQCR 142 - RESPIRABLE PARTICULATE (PM-10)
Micrograms per Cubic Meter

| County/City Site Code | Site Name/Location | Yr | Num Obs | Max Obs | 2nd Max | 3rd Max | Arith Mean |
|---|---|---|---|---|---|---|---|
| Gallatin/Bozeman | | | | | | | |
| 0120 002 F 01 | East Main City Building | 85 | 6 | 64 | 52 | 41 | 42.3 |
| Lewis and Clark/Helena | | | | | | | |
| 0720 001 F 01 | Cogswell Building | 85 | 36 | 80 | 64 | 60 | 31.5 |
| 0720 001 F 07 | Cogswell Building - Coll. | 85 | 36 | 83 | 63 | 61 | 32.8 |
| 0860 009 F 01 | Phillips Lane | 85 | 31 | 138 | 65 | 56 | 34.9 |
| Powell/Ovando | | | | | | | |
| 1260 024 F 03 | Terry Smith Ranch | 85 | 27 | 69 | 63 | 48 | 25.8 |
| Silver Bow/Butte | | | | | | | |
| 0160 005 F 01 | Greeley School | 85 | 28 | 302 | 235 | 235 | 86.7 |



# AQCR 143

# AQCR 143

## INTRODUCTION

This section deals with the air monitoring activities and pollution concerns in AQCR 143.

## LOCATION AND PHYSICAL FEATURES

AQCR 143 makes up the eastern third of the state. Glaciated plains cover the northern half of the region (Missouri River area and north) while sedimentary plains cover the southern half. The Missouri River travels east to west in the northern half; the Yellowstone River travels in a northeast direction through the southern half. The two rivers meet just across the Montana border in North Dakota. Figure 4 shows a regional map.

## POPULATION

The population of AQCR 143 is 105,700 (1984 estimate) or 12.8 percent of the state population. The people are scattered around the region in various small communities. The largest populated counties in the region are Richland (Sidney), Custer (Miles City) and Dawson (Glendive).

## POLLUTION SOURCES

Pollution sources and types of pollutants are listed for each county in the region. A final category lists the types of sources that would be expected in all counties in the region. The sources by county are as follows:

Custer County

Grain elevator/feed processing (particulates)

Daniels County

Coal-fired power plant (actually in Saskatchewan, Canada) - (particulates, $SO_2$, $NO_x$)

Dawson County

Grain elevator/feed processing (particulates)

Richland County

Sugar beet refinery (particulates, $SO_2$, NOx)

Coal-fired power plant (particulates, $SO_2$, NOx)

Two gas sweetening plants ($SO_2$)

Coal strip mine (particulates)

Oil well flares and vents ($SO_2$, $H_2S$)

Roosevelt County

Oil refinery (particulates, $SO_2$, NOx, CO)

Oil well flares and vents ($SO_2$, $H_2S$)

Rosebud County

Two coal strip mines (particulates)

Three coal-fired power plants (particulates, $SO_2$, NOx)

All Counties

Asphalt plants (particulates)

Gravel crushers (particulates)

Agricultural activities (particulates)

Wind erosion (particulates)

Automobiles (CO, $NO_x$, re-entrained particulates)

## MONITORING SITE DESCRIPTIONS

A number of monitoring sites were in operation during 1985. Table 29 lists the monitoring site descriptions. This includes site codes, site name, supporting agency, station type, project description, city name and county name.

## DATA SUMMARY

### Total Suspended Particulates

TSP was monitored at four sites in this region in 1985. The maximum 24-hour observation was 166 $ug/m^3$ at the Sidney-Downtown site. The highest annual geometric average was 68.0 $ug/m^3$ at the Sidney Downtown site. There were no violations of the TSP standards. Table 25 summarizes the TSP data for this region and Table 31 shows the number of exceedances.

### Sulfates

Sulfates were analyzed from hi-vol filters at one site (Sidney Downtown) in this region. This pollutant was discontinued after only 7 samples were analyzed. The maximum 24-hour observation was 5.0 $ug/m^3$. There is no air pollution standard for sulfates. Table 32 summarizes the sulfate data for this site.

### Sulfur Dioxide

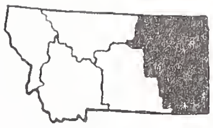
Sulfur dioxide was monitored at two sites in this region in 1985. The maximum one hour reading was .064 ppm and the maximum three hour average was .009 ppm the Scobey Border site. The highest annual average was .001 ppm at the Hanrahan site. There were no violations of the $SO_2$ standards. The Poplar River project was terminated at the end of June and the monitors were shutdown. Table 33 summarizes the sulfur dioxide data for this region and Table 34 shows the number of exceedances.

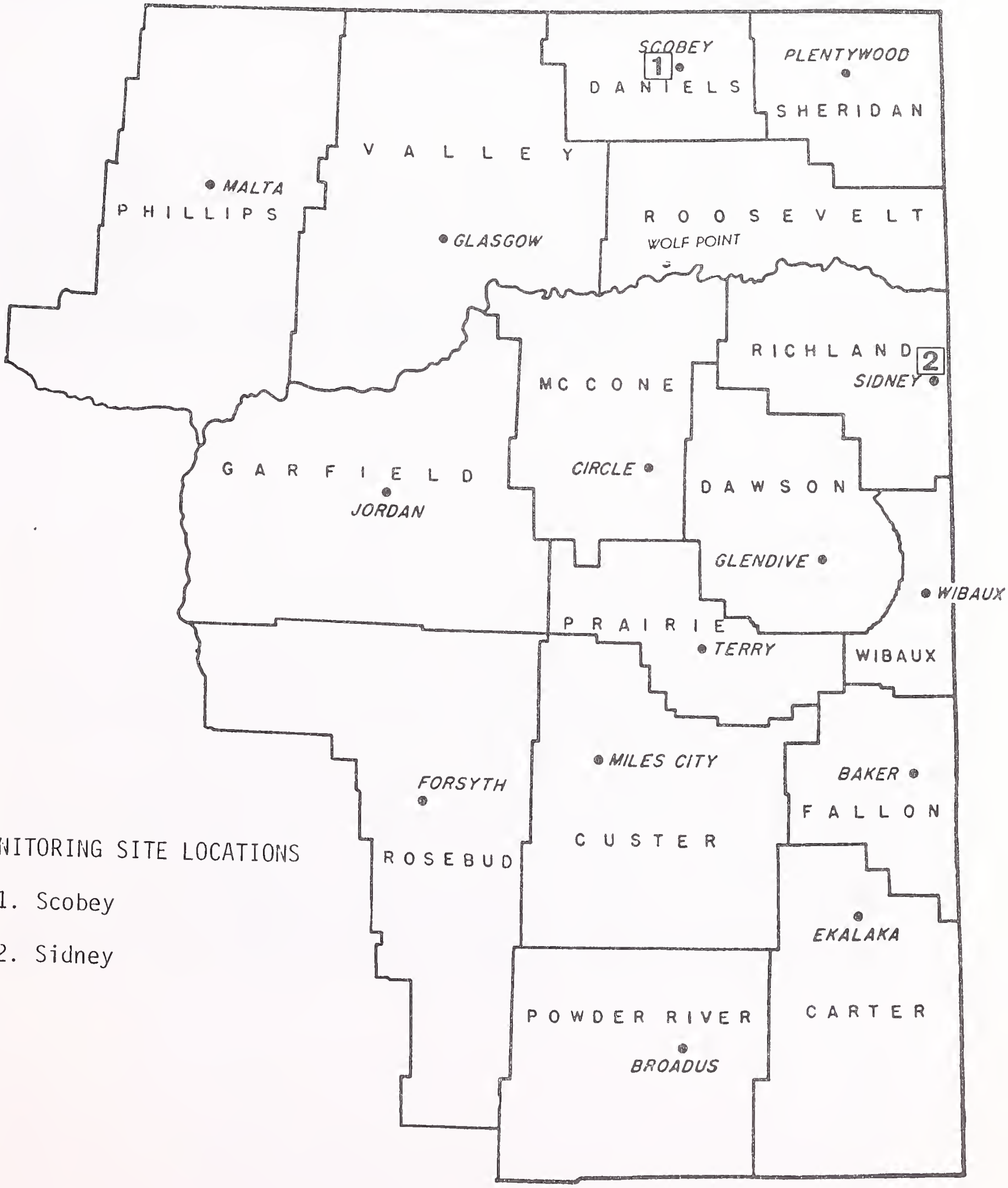
## Sulfation Rate

Sulfation rate was monitored at fifteen sites in Richland and Daniels Counties. All of the sites were collocated. The highest monthly average was .11 mg $SO_3/cm^2$/day at the Shell Oil site. The highest annual average was .04 mg $SO_3/cm^2$/day at the Shell Oil site. There has been a four year decline in sulfation rate in Richland county; this is probably due to a decrease in oil and gas production and exploration. There is no standard for sulfation rate; however, readings greater than .5 mg $SO_3/cm^2$/day indicate possible trouble spots. Table 35 summarizes the sulfation rate data for this region.

FIGURE 4

AQCR 143 - REGION MAP




SCOBEY
1
DANIELS
PLENTYWOOD
SHERIDAN
VALLEY
MALTA
PHILLIPS
GLASGOW
ROOSEVELT
WOLF POINT
RICHLAND
2
SIDNEY
MC CONE
CIRCLE
GARFIELD
JORDAN
DAWSON
GLENDIVE
WIBAUX
PRAIRIE
TERRY
WIBAUX
MILES CITY
FORSYTH
BAKER
FALLON
CUSTER
ROSEBUD
EKALAKA
POWDER RIVER
CARTER
BROADUS

MONITORING SITE LOCATIONS

1. Scobey
2. Sidney

## TABLE 29a
## AQCR 143 - MONITORING SITE DESCRIPTIONS

| AREA/SITE CODE | SITE NAME/ADDRESS<br>SUPPORTING AGENCY | STATION TYPE<br>PROJECT DESCRIPTION | CITY<br>COUNTY |
|---|---|---|---|
| 0340 001 F 03 | SCOBEY BORDER #1, US & CANADIAN BORDER<br>MONTANA AIR QUALITY BUREAU | RURAL-AGRICULTURAL<br>BACKGROUND | SCOBEY<br>DANIELS |
| 0340 001 F 07 | SCOBEY BORDER #1, US & CANADIAN BORDER<br>MONTANA AIR QUALITY BUREAU | RURAL-AGRICULTURAL<br>QA-COLOCATED SAMPLER | SCOBEY<br>DANIELS |
| 0340 002 F 03 | RICHARDSON, 1 MILE NORTH OF SCOBEY<br>MONTANA AIR QUALITY BUREAU | RURAL-NEAR URBAN<br>BACKGROUND | SCOBEY<br>DANIELS |
| 0340 002 F 07 | RICHARDSON, 1 MILE NORTH OF SCOBEY<br>MONTANA AIR QUALITY BUREAU | RURAL-NEAR URBAN<br>QA-COLOCATED SAMPLER | SCOBEY<br>DANIELS |
| 0340 004 F 03 | HANRAHAN RANCH, NEAR WHITETAIL<br>MONTANA AIR QUALITY BUREAU | RURAL-AGRICULTURAL<br>BACKGROUND | SCOBEY<br>DANIELS |
| 0340 004 F 07 | HANRAHAN RANCH, NEAR WHITETAIL<br>MONTANA AIR QUALITY BUREAU | RURAL-AGRICULTURAL<br>QA-COLOCATED SAMPLER | SCOBEY<br>DANIELS |
| 0340 005 F 02 | MICROWAVE TOWER<br>MONTANA AIR QUALITY BUREAU | REMOTE<br>SOURCE ORIENTED | SCOBEY<br>DANIELS |
| 0340 005 F 07 | MICROWAVE TOWER<br>MONTANA AIR QUALITY BUREAU | REMOTE<br>QA-COLOCATED SAMPLER | SCOBEY<br>DANIELS |
| 0340 006 F 02 | FLAXVILLE<br>MONTANA AIR QUALITY BUREAU | RURAL-NEAR URBAN<br>SOURCE ORIENTED | FLAXVILLE<br>DANIELS |
| 0340 006 F 07 | FLAXVILLE<br>MONTANA AIR QUALITY BUREAU | RURAL-NEAR URBAN<br>QA-COLOCATED SAMPLER | FLAXVILLE<br>DANIELS |
| 0340 007 F 02 | TV TOWER HILL<br>MONTANA AIR QUALITY BUREAU | RURAL-AGRICULTURAL<br>SOURCE ORIENTED | SCOBEY<br>DANIELS |
| 0340 007 F 07 | TV TOWER HILL<br>MONTANA AIR QUALITY BUREAU | RURAL-AGRICULTURAL<br>QA-COLOCATED SAMPLER | SCOBEY<br>DANIELS |
| 0340 008 F 02 | SCOBEY DOWNTOWN<br>MONTANA AIR QUALITY BUREAU | CITY CENTER-COMMERCIAL<br>SOURCE ORIENTED | SCOBEY<br>DANIELS |
| 0340 008 F 07 | SCOBEY DOWNTOWN<br>MONTANA AIR QUALITY BUREAU | CITY CENTER-COMMERCIAL<br>QA-COLOCATED SAMPLER | SCOBEY<br>DANIELS |
| 0340 009 F 02 | FOUR BUTTES<br>MONTANA AIR QUALITY BUREAU | RURAL-AGRICULTURAL<br>SOURCE ORIENTED | SCOBEY<br>DANIELS |
| 0340 009 F 07 | FOUR BUTTES<br>MONTANA AIR QUALITY BUREAU | RURAL-AGRICULTURAL<br>QA-COLOCATED SAMPLER | SCOBEY<br>DANIELS |

# TABLE 29b
## AQCR 143 - MONITORING SITE DESCRIPTIONS

| AREA/SITE CODE | SITE NAME/ADDRESS<br>SUPPORTING AGENCY | STATION TYPE<br>PROJECT DESCRIPTION | CITY<br>COUNTY |
|---|---|---|---|
| 1200 001 N 05 | MALTA BLM - BOWDOIN NAT WILDLIFE REFUGE<br>MONTANA AIR QUALITY BUREAU | RURAL-UNCLASSIFIED<br>SPECIAL STUDIES | MALTA<br>PHILLIPS |
| 1320 010 F 01 | SIDNEY DOWNTOWN - 115 2ND ST SE<br>MONTANA AIR QUALITY BUREAU | RURAL-AGRICULTURAL<br>POPULATION ORIENTED | SIDNEY<br>RICHLAND |
| 1320 011 F 02 | #1 PETERSON-MORLOCK - 2.7 MI NW OF SIDNEY<br>MONTANA AIR QUALITY BUREAU | RURAL-AGRICULTURAL<br>SOURCE ORIENTED | SIDNEY<br>RICHLAND |
| 1320 011 F 07 | #1 PETERSON-MORLOCK COLOCATED<br>MONTANA AIR QUALITY BUREAU | RURAL-AGRICULTURAL<br>QA-COLOCATED SAMPLER | SIDNEY<br>RICHLAND |
| 1320 012 F 02 | #2 PUBLIC WELFARE OFC - 5TH ST & 3RD AVE<br>MONTANA AIR QUALITY BUREAU | RURAL-AGRICULTURAL<br>SOURCE ORIENTED | SIDNEY<br>RICHLAND |
| 1320 012 F 07 | #2 PUBLIC WELFARE OFFICE COLOCATED<br>MONTANA AIR QUALITY BUREAU | RURAL-AGRICULTURAL<br>QA-COLOCATED SAMPLER | SIDNEY<br>RICHLAND |
| 1320 013 F 02 | #3 SHELL OIL - 6.1 MI E JCT HWY 16 & 23<br>MONTANA AIR QUALITY BUREAU | RURAL-AGRICULTURAL<br>SOURCE ORIENTED | SIDNEY<br>RICHLAND |
| 1320 013 F 07 | #3 SHELL OIL COLOCATED<br>MONTANA AIR QUALITY BUREAU | RURAL-INDUSTRIAL<br>QA-COLOCATED SAMPLER | SIDNEY<br>RICHLAND |
| 1320 028 F 02 | LUDINGTON<br>MONTANA AIR QUALITY BUREAU | RURAL-AGRICULTURAL<br>SOURCE ORIENTED | SIDNEY<br>RICHLAND |
| 1320 028 F 07 | LUDINGTON, EAST OF HIWAY 200<br>MONTANA AIR QUALITY BUREAU | RURAL-AGRICULTURAL<br>QA-COLOCATED SAMPLER | SIDNEY<br>RICHLAND |
| 1320 029 F 02 | RIVER ROAD #1<br>MONTANA AIR QUALITY BUREAU | RURAL-AGRICULTURAL<br>SOURCE ORIENTED | SIDNEY<br>ICHLAND |
| 1320 029 F 07 | RIVER ROAD #1, MILE NORTH OF RIVER ROAD<br>MONTANA AIR QUALITY BUREAU | RURAL-AGRICULTURAL<br>QA-COLOCATED SAMPLER | SIDNEY<br>RICHLAND |
| 1320 030 F 02 | RIVER ROAD #2<br>MONTANA AIR QUALITY BUREAU | RURAL-AGRICULTURAL<br>SOURCE ORIENTED | SIDNEY<br>RICHLAND |
| 1320 030 F 07 | RIVER ROAD #2, POWER POLE BESIDE RIVER RD<br>MONTANA AIR QUALITY BUREAU | RURAL-AGRICULTURAL<br>QA-COLOCATED SAMPLER | SIDNEY<br>RICHLAND |
| 1320 031 F 02 | GOSSET RESIDENCE<br>MONTANA AIR QUALITY BUREAU | RURAL-AGRICULTURAL<br>SOURCE ORIENTED | SIDNEY<br>RICHLAND |
| 1320 031 F 07 | GOSSETT RESIDENCE, 5 MILES EAST OF PICHE<br>MONTANA AIR QUALITY BUREAU | RURAL-AGRICULTURAL<br>QA-COLOCATED SAMPLER | SIDNEY<br>RICHLAND |

## TABLE 30
## AQCR 143 - TOTAL SUSPENDED PARTICULATES
Micrograms per Cubic Meter

| County/City Site Code | Site Name/Location | Yr | Num Obs | Max Obs | 2nd Max | 3rd Max | Arith Mean | Geom Mean |
|---|---|---|---|---|---|---|---|---|
| Daniels/Scobey | | | | | | | | |
| 0340 001 F 03 | Scobey Border | 82 | 43 | 234 | 50 | 47 | 26.0 | 17.5 |
| | | 83 | 25 | 58 | 50 | 46 | 16.7 | 9.7 |
| | | 84 | 26 | 54 | 48 | 42 | 23.3 | 16.4 |
| | | 85 | 22 | 82 | 62 | 54 | 29.5 | 20.7 |
| 0340 002 F 03 | Richardson | 82 | 21 | 63 | 28 | 25 | 16.5 | 13.2 |
| | | 83 | 24 | 233 | 54 | 50 | 24.1 | 11.0 |
| | | 84 | 26 | 114 | 62 | 48 | 25.3 | 17.1 |
| | | 85 | 22 | 110 | 69 | 54 | 27.8 | 19.2 |
| 0340 004 F 03 | Hanrahan Ranch | 82 | 39 | 144 | 47 | 43 | 22.1 | 16.0 |
| | | 83 | 27 | 108 | 56 | 55 | 18.4 | 9.4 |
| | | 84 | 30 | 89 | 84 | 48 | 27.3 | 19.4 |
| | | 85 | 28 | 73 | 68 | 44 | 22.9 | 17.1 |
| Richland/Sidney | | | | | | | | |
| 1320 010 F 01 | Sidney Downtown | 83 | 30 | 116 | 96 | 92 | 56.1 | 50.8 |
| | | 84 | 30 | 233 | 155 | 132 | 78.1 | 68.0 |
| | | 85 | 50 | 166 | 138 | 113 | 57.0 | 50.3 |

## TABLE 31
## AQCR 143 - TSP - Number of Exceedances
Micrograms per Cubic Meter

| County/City Site Code | Site Name/Location | Yr | Num Obs | Federal Prim Daily 260 | Federal Prim Annual G 75 | Federal Sec Daily 150 | Federal Sec Annual G 60 | Montana Std Daily 200 | Montana Std Annual A 75 |
|---|---|---|---|---|---|---|---|---|---|
| Daniels/Scobey | | | | | | | | | |
| 0340 001 F 03 | Scobey Border | 85 | 22 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0340 002 F 03 | Richardson | 85 | 22 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0340 004 F 03 | Hanrahan Ranch | 85 | 28 | 0 | 0 | 0 | 0 | 0 | 0 |
| Richland/Sidney | | | | | | | | | |
| 1320 010 F 01 | Sidney Downtown | 85 | 50 | 0 | 0 | 1 | 0 | 0 | 0 |

### TABLE 32
### AQCR 143 - SULFATES
Micrograms per Cubic Meter

| County/City Site Code | Site Name/Location | Yr | Num Obs | Max Obs | 2nd Max | 3rd Max | Arith Mean |
|---|---|---|---|---|---|---|---|
| Richland/Sidney | | | | | | | |
| 1320 010 F 01 | Sidney - Downtown | 83 | 30 | 9.2 | 8.4 | 6.4 | 4.6 |
| | | 84 | 30 | 13.4 | 7.0 | 6.7 | 4.9 |
| | | 85 | 7 | 5.0 | 5.0 | 4.4 | 3.9 |

## TABLE 33a
## AQCR 143 - SULFUR DIOXIDE
Parts Per Million

| Site Code | Site Name/Location | Yr | Mo | Num Obs | Max Obs | 2nd Max | 3rd Max | 3 Hr Max | 24 Hr Max | Monthly Average |
|---|---|---|---|---|---|---|---|---|---|---|
| 0340 001 F 03 | Scobey - Border | 82 | 01 | 744 | .016 | .015 | .015 | .013 | .004 | .000 |
| | | | 02 | 545 | .017 | .015 | .014 | .013 | .009 | .004 |
| | | | 03 | 741 | .023 | .021 | .021 | .020 | .020 | .008 |
| | | | 04 | 592 | .017 | .015 | .015 | .015 | .011 | .004 |
| | | | 05 | 744 | .022 | .019 | .019 | .017 | .011 | .002 |
| | | | 06 | 718 | .028 | .024 | .024 | .022 | .011 | .002 |
| | | | 07 | 240 | .023 | .020 | .015 | .015 | .003 | .001 |
| | | | 08 | 714 | .033 | .030 | .023 | .025 | .013 | .001 |
| | | | 09 | 710 | .060 | .053 | .044 | .052 | .012 | .002 |
| | | | 10 | 735 | .047 | .043 | .030 | .039 | .011 | .003 |
| | | | 11 | 699 | .036 | .035 | .034 | .030 | .010 | .005 |
| | | | 12 | 740 | .022 | .014 | .012 | .009 | .002 | .000 |
| | | ANNUAL | | 7922 | .060 | .053 | .047 | .052 | .020 | .002 |
| 0340 001 F 03 | Scobey - Border | 83 | 01 | 708 | .042 | .042 | .036 | .040 | .011 | .002 |
| | | | 02 | 662 | .017 | .017 | .016 | .014 | .007 | .002 |
| | | | 03 | 730 | .009 | .009 | .008 | .009 | .003 | .000 |
| | | | 04 | 713 | .034 | .026 | .023 | .024 | .008 | .001 |
| | | | 05 | 387 | .041 | .034 | .023 | .022 | .005 | .001 |
| | | | 06 | 696 | .023 | .018 | .015 | .014 | .004 | .000 |
| | | | 07 | --- | --- | --- | --- | --- | --- | --- |
| | | | 08 | --- | --- | --- | --- | --- | --- | --- |
| | | | 09 | --- | --- | --- | --- | --- | --- | --- |
| | | | 10 | --- | --- | --- | --- | --- | --- | --- |
| | | | 11 | --- | --- | --- | --- | --- | --- | --- |
| | | | 12 | --- | --- | --- | --- | --- | --- | --- |
| | | ANNUAL | | 3896 | .042 | .042 | .041 | .040 | .011 | .001 |

# TABLE 33b
## AQCR 143 - SULFUR DIOXIDE
Parts Per Million

| Site Code | Site Name/Location | Yr | Mo | Num Obs | Max Obs | 2nd Max | 3rd Max | 3 Hr Max | 24 Hr Max | Monthly Average |
|---|---|---|---|---|---|---|---|---|---|---|
| 0340 001 F 03 | Scobey - Border | 84 | 01 | --- | --- | --- | --- | --- | --- | --- |
| | | | 02 | --- | --- | --- | --- | --- | --- | --- |
| | | | 03 | --- | --- | --- | --- | --- | --- | --- |
| | | | 04 | --- | --- | --- | --- | --- | --- | --- |
| | | | 05 | --- | --- | --- | --- | --- | --- | --- |
| | | | 06 | --- | --- | --- | --- | --- | --- | --- |
| | | | 07 | 729 | .060 | .050 | .035 | .041 | .011 | .001 |
| | | | 08 | 731 | .080 | .060 | .050 | .040 | .012 | .001 |
| | | | 09 | 701 | .025 | .020 | .018 | .017 | .003 | .000 |
| | | | 10 | 739 | .032 | .020 | .016 | .020 | .004 | .000 |
| | | | 11 | 708 | .085 | .055 | .050 | .045 | .012 | .001 |
| | | | 12 | 738 | .048 | .015 | .011 | .018 | .003 | .000 |
| | | ANNUAL | | 4346 | .085 | .080 | .060 | .045 | .012 | .000 |
| 0340 001 F 03 | Scobey - Border | 85 | 01 | 733 | .127 | .060 | .050 | .064 | .009 | .000 |
| | | | 02 | 668 | .026 | .020 | .013 | .018 | .003 | .000 |
| | | | 03 | 729 | .050 | .045 | .031 | .029 | .006 | .000 |
| | | | 04 | 698 | .040 | .018 | .016 | .022 | .003 | .000 |
| | | | 05 | 465 | .033 | .029 | .024 | .015 | .003 | .000 |
| | | | 06 | 572 | .062 | .056 | .050 | .038 | .009 | .002 |
| | | | 07 | --- | --- | --- | --- | --- | --- | --- |
| | | | 08 | --- | --- | --- | --- | --- | --- | --- |
| | | | 09 | --- | --- | --- | --- | --- | --- | --- |
| | | | 10 | --- | --- | --- | --- | --- | --- | --- |
| | | | 11 | --- | --- | --- | --- | --- | --- | --- |
| | | | 12 | --- | --- | --- | --- | --- | --- | --- |
| | | ANNUAL | | 3865 | .127 | .062 | .060 | .064 | .009 | .000 |

## TABLE 33c
## AQCR 143 - SULFUR DIOXIDE
Parts Per Million

| Site Code | Site Name/Location | Yr | Mo | Num Obs | Max Obs | 2nd Max | 3rd Max | 3 Hr Max | 24 Hr Max | Monthly Average |
|---|---|---|---|---|---|---|---|---|---|---|
| 0340 004 F 03 | Hanrahan | 82 | 01 | 551 | .005 | .005 | .004 | .003 | .003 | .001 |
| | | | 02 | 647 | .009 | .007 | .006 | .006 | .003 | .001 |
| | | | 03 | 663 | .007 | .007 | .007 | .006 | .006 | .001 |
| | | | 04 | 666 | .003 | .003 | .003 | .003 | .002 | .000 |
| | | | 05 | 641 | .012 | .010 | .009 | .009 | .006 | .001 |
| | | | 06 | 624 | .005 | .005 | .004 | .003 | .002 | .000 |
| | | | 07 | 216 | .000 | .000 | .000 | .000 | .000 | .000 |
| | | | 08 | 707 | .010 | .004 | .004 | .003 | .001 | .000 |
| | | | 09 | 705 | .022 | .020 | .015 | .016 | .004 | .000 |
| | | | 10 | 726 | .013 | .013 | .008 | .007 | .001 | .000 |
| | | | 11 | 720 | .029 | .024 | .017 | .019 | .006 | .000 |
| | | | 12 | 742 | .012 | .012 | .012 | .008 | .001 | .000 |
| | | ANNUAL | | 7608 | .029 | .024 | .022 | .019 | .006 | .000 |
| 0340 004 F 03 | Hanrahan | 83 | 01 | 682 | .020 | .011 | .010 | .011 | .002 | .000 |
| | | | 02 | 663 | .024 | .018 | .014 | .009 | .003 | .000 |
| | | | 03 | 711 | .008 | .005 | .003 | .004 | .000 | .000 |
| | | | 04 | 714 | .010 | .005 | .005 | .004 | .001 | .000 |
| | | | 05 | 731 | .016 | .014 | .010 | .007 | .001 | .000 |
| | | | 06 | 709 | .010 | .004 | .004 | .004 | .001 | .000 |
| | | | 07 | --- | --- | --- | --- | --- | --- | --- |
| | | | 08 | --- | --- | --- | --- | --- | --- | --- |
| | | | 09 | --- | --- | --- | --- | --- | --- | --- |
| | | | 10 | --- | --- | --- | --- | --- | --- | --- |
| | | | 11 | --- | --- | --- | --- | --- | --- | --- |
| | | | 12 | --- | --- | --- | --- | --- | --- | --- |
| | | ANNUAL | | 4210 | .024 | .020 | .018 | .011 | .003 | .000 |

# TABLE 33d
# AQCR 143 - SULFUR DIOXIDE
Parts Per Million

| Site Code | Site Name/Location | Yr | Mo | Num Obs | Max Obs | 2nd Max | 3rd Max | 3 Hr Max | 24 Hr Max | Monthly Average |
|---|---|---|---|---|---|---|---|---|---|---|
| 0340 004 F 03 | Hanrahan | 84 | 01 | --- | --- | --- | --- | --- | --- | --- |
| | | | 02 | --- | --- | --- | --- | --- | --- | --- |
| | | | 03 | --- | --- | --- | --- | --- | --- | --- |
| | | | 04 | --- | --- | --- | --- | --- | --- | --- |
| | | | 05 | --- | --- | --- | --- | --- | --- | --- |
| | | | 06 | --- | --- | --- | --- | --- | --- | --- |
| | | | 07 | 552 | .025 | .022 | .012 | .018 | .004 | .000 |
| | | | 08 | 657 | .048 | .027 | .021 | .025 | .007 | .001 |
| | | | 09 | 713 | .012 | .010 | .007 | .009 | .004 | .002 |
| | | | 10 | 739 | .024 | .018 | .015 | .017 | .005 | .003 |
| | | | 11 | 703 | .041 | .035 | .030 | .032 | .012 | .002 |
| | | | 12 | 650 | .023 | .012 | .012 | .010 | .004 | .001 |
| | | ANNUAL | | 4014 | .048 | .041 | .035 | .032 | .012 | .001 |
| 0340 004 F 03 | Hanrahan | 85 | 01 | 738 | .031 | .028 | .028 | .023 | .006 | .000 |
| | | | 02 | 666 | .030 | .027 | .025 | .026 | .008 | .001 |
| | | | 03 | 740 | .027 | .024 | .017 | .022 | .006 | .001 |
| | | | 04 | 651 | .019 | .015 | .009 | .009 | .001 | .000 |
| | | | 05 | 736 | .014 | .014 | .010 | .009 | .002 | .000 |
| | | | 06 | 547 | .025 | .019 | .017 | .015 | .005 | .002 |
| | | | 07 | --- | --- | --- | --- | --- | --- | --- |
| | | | 08 | --- | --- | --- | --- | --- | --- | --- |
| | | | 09 | --- | --- | --- | --- | --- | --- | --- |
| | | | 10 | --- | --- | --- | --- | --- | --- | --- |
| | | | 11 | --- | --- | --- | --- | --- | --- | --- |
| | | | 12 | --- | --- | --- | --- | --- | --- | --- |
| | | ANNUAL | | 4078 | .031 | .030 | .028 | .026 | .008 | .001 |

## TABLE 34
## AQCR 143 - SO2 - Number of Exceedances
Parts per Million

| County/City Site Code | Site Name/Location | Yr | Num Obs | Federal 24-Hr 0.14 | Prim Annual 0.03 | Federal Sec 3-Hr 0.50 | Montana Std 1-Hr 0.50 | Montana Std 24-Hr 0.10 | Montana Std Annual 0.20 |
|---|---|---|---|---|---|---|---|---|---|
| Daniels/Scobey | | | | | | | | | |
| 0340 001 F 03 | Scobey Border | 85 | 3865 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0340 004 F 03 | Hanrahan Ranch | 85 | 4078 | 0 | 0 | 0 | 0 | 0 | 0 |

## TABLE 35a
## AQCR 143 - SULFATION RATE
Milligrams Sulfur Trioxide per 100 Square Centimeters per Day

| County/City Site Code | Site Name/Location | Yr | Num Obs | Max Obs | 2nd Max | 3rd Max | Arith Mean |
|---|---|---|---|---|---|---|---|
| Daniels/Scobey | | | | | | | |
| 0340 001 F 03 | Scobey Border | 84 | 6 | .05 | .05 | .02 | .02 |
| | | 85 | 12 | .10 | .06 | .04 | .01 |
| 0340 001 F 07 | Scobey Border - Collocated | 84 | 5 | .04 | .02 | .01 | .01 |
| | | 85 | 6 | .01 | .01 | .00 | .00 |
| 0340 002 F 03 | Richardson | 84 | 6 | .02 | .00 | .00 | .00 |
| | | 85 | 12 | .05 | .05 | .01 | .00 |
| 0340 002 F 07 | Richardson - Collocated | 84 | 6 | .00 | .00 | .00 | .00 |
| | | 85 | 7 | .01 | .01 | .01 | .00 |
| 0340 004 F 03 | Hanrahan | 84 | 5 | .04 | .01 | .00 | .01 |
| | | 85 | 11 | .10 | .07 | .04 | .02 |
| 0340 004 F 07 | Hanrahan - Collocated | 84 | 6 | .04 | .03 | .01 | .01 |
| | | 85 | 11 | .07 | .01 | .00 | .00 |
| 0340 005 F 02 | Microwave Tower | 84 | 5 | .02 | .01 | .00 | .00 |
| | | 85 | 11 | .10 | .05 | .01 | .01 |
| 0340 005 F 07 | Microwave Tower - Collocated | 84 | 6 | .05 | .02 | .00 | .01 |
| | | 85 | 7 | .08 | .00 | .00 | .01 |
| 0340 006 F 02 | Flaxville | 84 | 6 | .05 | .01 | .00 | .01 |
| | | 85 | 12 | .10 | .06 | .04 | .01 |
| 0340 006 F 07 | Flaxville - Collocated | 84 | 6 | .01 | .01 | .00 | .00 |
| | | 85 | 7 | .09 | .00 | .00 | .01 |
| 0340 007 F 02 | TV Tower Hill | 84 | 6 | .01 | .00 | .00 | .00 |
| | | 85 | 11 | .06 | .04 | .04 | .01 |

## TABLE 35b
## AQCR 143 - SULFATION RATE
Milligrams Sulfur Trioxide per 100 Square Centimeters per Day

| County/City Site Code | Site Name/Location | Yr | Num Obs | Max Obs | 2nd Max | 3rd Max | Arith Mean |
|---|---|---|---|---|---|---|---|
| Daniels/Scobey | | | | | | | |
| 0340 007 F 07 | TV Tower Hill - Collocated | 84 | 6 | .05 | .03 | .01 | .01 |
| | | 85 | 7 | .02 | .00 | .00 | .00 |
| 0340 008 F 02 | Scobey Downtown | 84 | 4 | .09 | .03 | .00 | .03 |
| | | 85 | 10 | .07 | .06 | .05 | .01 |
| 0340 008 F 07 | Scobey Downtown - Collocated | 84 | 6 | .07 | .04 | .03 | .02 |
| | | 85 | 5 | .04 | .00 | .00 | .00 |
| 0340 009 F 02 | Four Buttes | 84 | 5 | .01 | .00 | .00 | .00 |
| | | 85 | 12 | .03 | .00 | .00 | .00 |
| 0340 009 F 07 | Four Buttes - Collocated | 84 | 6 | .01 | .00 | .00 | .00 |
| | | 85 | 7 | .00 | .00 | .00 | .00 |
| Richland/Sidney | | | | | | | |
| 1320 011 F 02 | Peterson - Morlock | 82 | 6 | .30 | .11 | .09 | .11 |
| | | 83 | 7 | .14 | .13 | .12 | .08 |
| | | 84 | 4 | .14 | .11 | .10 | .08 |
| | | 85 | 8 | .09 | .08 | .03 | .02 |
| 1320 011 F 07 | Peterson - Morlock - Coll. | 85 | 3 | .00 | .00 | .00 | .00 |
| 1320 012 F 02 | Public Welfare Office | 82 | 2 | .14 | .12 | --- | .13 |
| | | 83 | 8 | .18 | .16 | .14 | .10 |
| | | 84 | 5 | .10 | .08 | .00 | .03 |
| | | 85 | 8 | .07 | .07 | .05 | .02 |
| 1320 012 F 07 | Public Welfare Office - Coll. | 85 | 4 | .00 | .00 | .00 | .00 |

# TABLE 35c
## AQCR 143 - SULFATION RATE
Milligrams Sulfur Trioxide per 100 Square Centimeters per Day

| County/City Site Code | Site Name/Location | Yr | Num Obs | Max Obs | 2nd Max | 3rd Max | Arith Mean |
|---|---|---|---|---|---|---|---|
| Richland/Sidney | | | | | | | |
| 1320 013 F 02 | Shell Oil | 82 | 6 | .36 | .21 | .14 | .17 |
| | | 83 | 6 | .19 | .19 | .14 | .14 |
| | | 84 | 5 | .19 | .11 | .11 | .10 |
| | | 85 | 8 | .11 | .06 | .05 | .04 |
| 1320 013 F 07 | Shell Oil - Collocated | 85 | 8 | .10 | .05 | .05 | .03 |
| 1320 028 F 02 | Ludington | 85 | 6 | .09 | .06 | .00 | .02 |
| 1320 028 F 07 | Ludington - Collocated | 85 | 3 | .00 | .00 | .00 | .00 |
| 1320 029 F 02 | River Road #1 | 85 | 8 | .08 | .02 | .00 | .01 |
| 1320 029 F 02 | River Road #1 - Collocated | 85 | 4 | .00 | .00 | .00 | .00 |
| 1320 030 F 03 | River Road #2 | 85 | 8 | .07 | .06 | .02 | .02 |
| 1320 030 F 07 | River Road #2 - Collocated | 85 | 4 | .01 | .00 | .00 | .00 |
| 1320 031 F 02 | Gossett Residence | 85 | 8 | .06 | .06 | .01 | .01 |
| 1320 031 F 07 | Gossett Residence - Collocated | 85 | 4 | .01 | .00 | .00 | .00 |

# AQCR 144

# AQCR 144

## INTRODUCTION

This section deals with the air monitoring activities and pollution concerns in AQCR 144.

## LOCATION AND PHYSICAL FEATURES

AQCR 144 is located in the northwest corner of the state. The region is entirely west of the Continental Divide. The region contains several distinct mountain ranges separated by fairly narrow valleys. The main rivers in the region are the Clark Fork, Flathead, and Kootenai. Figure 5 shows a regional map.

## POPULATION

The population of AQCR 144 is 207,200 (1984 estimate) or 25.1 percent of the state population. The majority of the people in this region live in Missoula County (Missoula) and Flathead County (Kalispell).

## POLLUTION SOURCES

Pollution sources and types of pollutants are listed for each county in the region. A final category lists the types of sources that would be expected in all counties in the region. The sources by county are as follows:

Flathead County

- Aluminum reduction plant (particulates, fluorides)
- Two plywood plants (particulates)
- Particleboard plant (particulates)
- Several sawmills (particulates)

Lake County

- Two sawmills (particulates)

Lincoln County

- Copper/silver mine (particulates)
- Vermiculite mining and manufacturing (particulates)
- Plywood plant (particulates)
- Sawmills (particulates)

Mineral County

- Two sawmills (particulates)

Missoula County

- Plywood plant (particulates)
- Particleboard plant (particulates)
- Several sawmills (particulates)
- Kraft pulp mill (particulates, $H_2S$)

Ravalli County

- Two sawmills (particulates)

Sanders County

- Three sawmills (particulates)
- Antimony mine and mill (particulates)

All Counties

- Asphalt plants (particulates)
- Gravel crushers (particulates)

Automobiles (particulates, CO)

Slash and open burning (particulates, CO)

Residential wood burning (particulates, CO)

Agricultural activities (particulates)

## MONITORING SITE DESCRIPTIONS

A number of monitoring sites were in operation during 1985. Table 30 lists the monitoring site descriptions. This includes site codes, site name, supporting agency, station type, project description, city name and county name.

## DATA SUMMARY

### Total Suspended Particulates

TSP was monitored at 16 sites in this region in 1985. Three of the sites were collocated. The maximum 24-hour observation was 642 ug/m$^3$ at the Lincoln County Courthouse site in Libby. The highest valid annual geometric average was 99.6 ug/m$^3$ also at the Lincoln County Courthouse. The highest annual arithmetic average was 122.2 ug/m$^3$. There were three violations of the federal annual standard: Lincoln County Courthouse in Libby, Universal Athletics in Kalispell, and Sanders County Courthouse in Thompson Falls. There were five sites that were in violation of the Montana annual arithmetic standard: Lincoln County Courthouse in Libby, Anders Residence in Columbia Falls, Universal Athletics in Kalispell, Boyd Park in Missoula, and the Sanders County Courthouse in Thompson Falls. There were eight sites in violation of the federal 24-hour standard and there were eight sites in violation of the Montana 24-hour standard. TSP readings in western Montana are often high due to emissions from paved and unpaved roads, wood stoves, and industrial sources, and due to meteorological and physical features (calm winds, inversions, and narrow valleys) which cause pollutants to be trapped and built up. Table 37 summarizes the TSP data for this region and Table 38 shows the number of exceedances.

## Visibility

Visibility was measured with an integrating nephelometer at one site in this region in 1985. The maximum hourly observation was 69.2 x $10^{-5}$ particle scattering coefficient per meter at the Libby-River site. The annual average for the three months the sampler ran was 12.6 x $10^{-5}$ particle scattering coefficient per meter. The annual standard of 3 x $10^{-5}$ applies only to PSD Class I areas. This sampler was run in connection with the department's fall smoke management program. Table 39 summarizes the visibility data for this region.

## Nitrates

Nitrates were analyzed from hi-vol filters at two sites in this region in 1985. The maximum 24-hour observation was 2.0 ug/$m^3$ at the St. Mary site in Glacier Park. There is no air pollution standard for nitrates. Table 40 summarizes the nitrate data for this region.

## Sulfates

Sulfates were analyzed from hi-vol filters at five sites in this region in 1985. The maximum 24-hour observation was 14.5 ug/$m^3$ at the Hoerner Waldorf #2 site in Missoula. There is no air pollution standard for sulfates. Table 41 summarizes the sulfate data for this region.

## Carbon Monoxide

Carbon monoxide was monitored at one site in the region in 1985: Boyd Park in Missoula. The maximum hourly observation was 14.9 ppm. The maximum eight hour observation was 11.0 ppm. There were two violations of the eight hour standard. Sources that contribute to CO are automotive exhaust, wood stoves, and fireplaces. Table 42 summarizes the carbon monoxide data for this region and Table 43 shows the number of exceedances.

## Respirable Particulates (PM15)

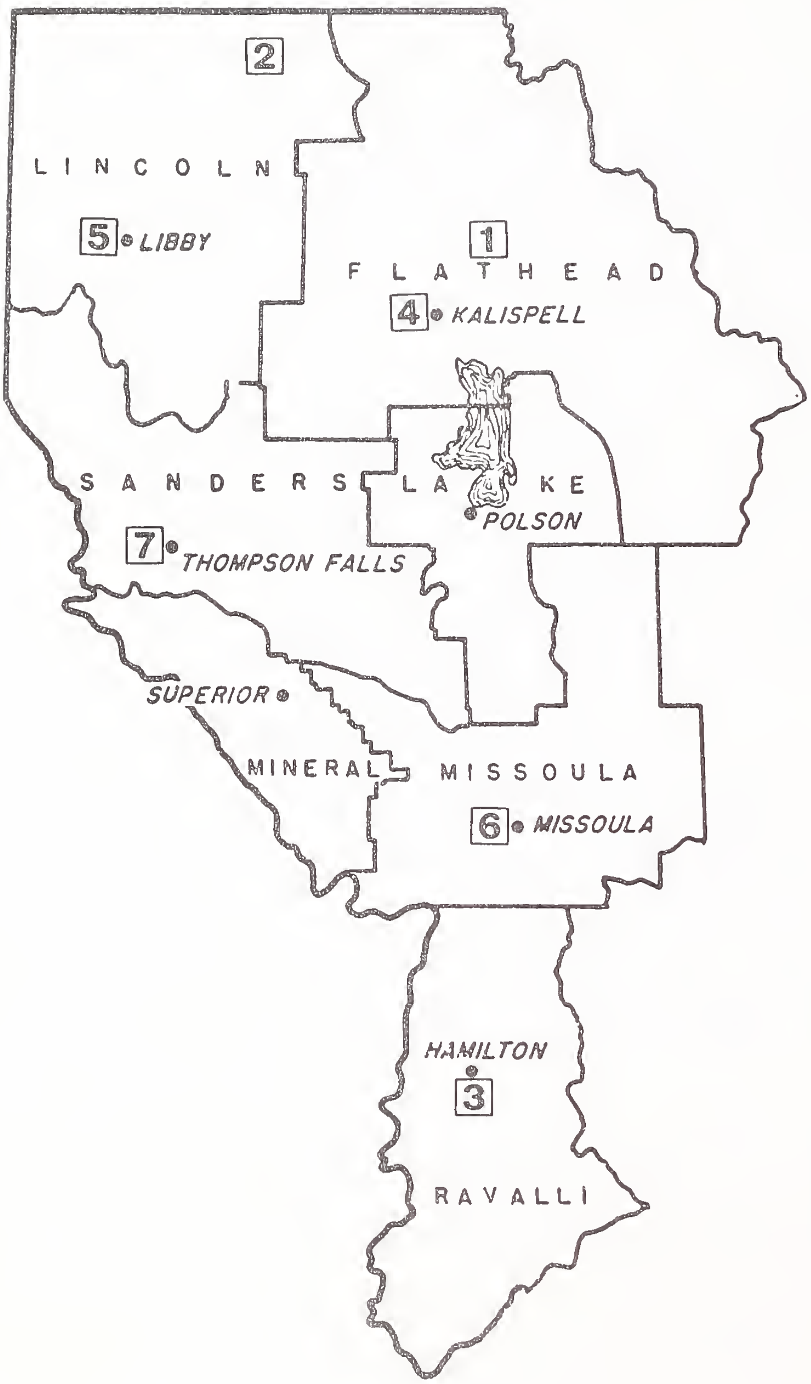
Particulate matter less than 15 microns (PM15) was monitored at two sites in Missoula County in 1985. The maximum 24-hour observation was 140 $ug/m^3$ at the Health Department site. An annual arithmetic mean of 46.8 $ug/m^3$ was measured at the Meadow Hills site. There is no standard for particulate matter using this method, but it does give an indication of the respirable portion of the TSP concentrations. Table 44 summarizes the PM15 data for this region.

## Respirable Particulates (PM10)

Particulate matter less than 10 microns (PM10) was monitored at seven sites in this region in 1985. One of the sites was collocated. The maximum 24-hour observation was 257 $ug/m^3$ at the Rose Park site. There is currently no standard for PM10. The federal government will probably propose a standard in the next year. Table 45 summarizes the PM10 data for this region.

FIGURE 5

AQCR 144 - REGION MAP


2
LINCOLN
5
LIBBY
1
FLATHEAD
4
KALISPELL
SANDERS
LAKE
POLSON
7
THOMPSON FALLS
SUPERIOR
MINERAL
MISSOULA
6
MISSOULA
HAMILTON
3
RAVALLI

MONITORING SITE LOCATIONS

1. Columbia Falls
2. Eureka
3. Hamilton
4. Kalispell
5. Libby
6. Missoula
7. Thompson Falls

## TABLE 36a
## AQCR 144 - MONITORING SITE DESCRIPTIONS

| AREA/SITE CODE | SITE NAME/ADDRESS<br>SUPPORTING AGENCY | STATION TYPE<br>PROJECT DESCRIPTION | CITY<br>COUNTY |
|---|---|---|---|
| 0270 003 F 01 | JR HIGH SCHOOL, 500 4TH AVENUE NORTH<br>MONTANA AIR QUALITY BUREAU | SUBURBAN-RESIDENTIAL<br>POPULATION ORIENTED | COLUMBIA FALLS<br>FLATHEAD |
| 0270 005 F 01 | ANDERS RESIDENCE, 726 FIRST STREET<br>MONTANA AIR QUALITY BUREAU | CITY CENTER-RESIDENTIAL<br>POPULATION ORIENTED | COLUMBIA FALLS<br>FLATHEAD |
| 0270 006 F 05 | 981 2ND STREET (LABERE)<br>MONTANA AIR QUALITY BUREAU | SUBURBAN-RESIDENTIAL<br>SPECIAL STUDIES | COLUMBIA FALLS<br>FLATHEAD |
| 0570 007 F 02 | GLACIER NATL PARK # 5, FIRE WEATHER STATN<br>MONTANA AIR QUALITY BUREAU | RURAL-UNCLASSIFIED<br>SOURCE ORIENTED | <br>FLATHEAD |
| 0570 010 F 02 | GLACIER NATL PARK # 8, ST MARY'S<br>MONTANA AIR QUALITY BUREAU | RURAL-UNCLASSIFIED<br>SOURCE ORIENTED | <br>GLACIER |
| 0800 015 F 01 | UNIVERSAL ATHLETIC - 226 MAIN STREET<br>MONTANA AIR QUALITY BUREAU | SUBURBAN-COMMERCIAL<br>POPULATION ORIENTED | KALISPELL<br>FLATHEAD |
| 0900 010 F 01 | BROWN RESIDENCE - 1119 DAKOTA<br>MONTANA AIR QUALITY BUREAU | CITY CENTER-RESIDENTIAL<br>POPULATION ORIENTED | LIBBY<br>LINCOLN |
| 0900 012 F 01 | LINCOLN CO COURTHOUSE, 413 MINERAL AVE<br>MONTANA AIR QUALITY BUREAU | CITY CENTER-COMMERCIAL<br>POPULATION ORIENTED | LIBBY<br>LINCOLN |
| 0900 012 F 07 | LINCOLN CO COURTHOUSE - COLOCATED<br>MONTANA AIR QUALITY BUREAU | CITY CENTER-COMMERCIAL<br>QA-COLOCATED SAMPLER | LIBBY<br>LINCOLN |
| 0900 013 F 05 | RIVER SITE - N OF LIBBY<br>MONTANA AIR QUALITY BUREAU | RURAL-NEAR URBAN<br>SPECIAL STUDIES | LIBBY<br>LINCOLN |
| 0900 017 F 05 | HORELICK RESIDENCE, 707 MICHIGAN AVENUE<br>MONTANA AIR QUALITY BUREAU | CITY CENTER-INDUSTRIAL<br>SPECIAL STUDIES | LIBBY<br>LINCOLN |
| 0940 005 F 01 | LINCOLN ELECTRIC CO-OP - S OF HIWAY 93<br>MONTANA AIR QUALITY BUREAU | RURAL-COMMERCIAL<br>POPULATION ORIENTED | EUREKA<br>LINCOLN |
| 0940 006 F 05 | TISH BURRIS RESIDENCE,10 MI SOUTH OF TROY<br>MONTANA AIR QUALITY BUREAU | REMOTE<br>SPECIAL STUDIES | TROY<br>LINCOLN |
| 1100 015 G 02 | HOERNER WALDORF #1 - RAILROAD BLUFF<br>MISSOULA CITY-COUNTY HEALTH DEPARTMENT | RURAL-INDUSTRIAL<br>SOURCE ORIENTED | MISSOULA<br>MISSOULA |
| 1100 015 G 07 | HOERNER WALDORF #1 - COLOCATED<br>MISSOULA CITY-COUNTY HEALTH DEPARTMENT | RURAL-INDUSTRIAL<br>QA-COLOCATED SAMPLER | MISSOULA<br>MISSOULA |
| 1100 016 G 02 | HOERNER WALDORF #2 - WELL FIELD<br>MISSOULA CITY-COUNTY HEALTH DEPARTMENT | RURAL-INDUSTRIAL<br>SOURCE ORIENTED | MISSOULA<br>MISSOULA |

## TABLE 36b
## AQCR 144 - MONITORING SITE DESCRIPTIONS

PAGE: 2

| AREA/SITE CODE | SITE NAME/ADDRESS<br>SUPPORTING AGENCY | STATION TYPE<br>PROJECT DESCRIPTION | CITY<br>COUNTY |
|---|---|---|---|
| 1100 020 G 01 | ROSE PARK - 1/2 BLOCK FROM HIWAY 93 S<br>MISSOULA CITY-COUNTY HEALTH DEPARTMENT | CITY CENTER-RESIDENTIAL<br>POPULATION ORIENTED | MISSOULA<br>MISSOULA |
| 1100 024 G 02 | BOYD PARK - 3100 WASHBURN<br>MISSOULA CITY-COUNTY HEALTH DEPARTMENT | SUBURBAN-RESIDENTIAL<br>SOURCE ORIENTED | MISSOULA<br>MISSOULA |
| 1100 024 G 07 | BOYD PARK - COLOCATED<br>MISSOULA CITY-COUNTY HEALTH DEPARTMENT | SUBURBAN-RESIDENTIAL<br>QA-COLOCATED SAMPLER | MISSOULA<br>MISSOULA |
| 1100 029 G 01 | MEADOW HILLS - BRIGGS & RESERVE<br>MISSOULA CITY-COUNTY HEALTH DEPARTMENT | SUBURBAN-INDUSTRIAL<br>POPULATION ORIENTED | MISSOULA<br>MISSOULA |
| 1100 030 G 01 | SPURGIN & TOWER - SPURGIN RD & TOWER ST<br>MISSOULA CITY-COUNTY HEALTH DEPARTMENT | SUBURBAN-INDUSTRIAL<br>POPULATION ORIENTED | MISSOULA<br>MISSOULA |
| 1100 031 G 02 | HEALTH DEPARTMENT, 301 WEST ALDER<br>MISSOULA COUNTY HEALTH DEPARTMENT | CITY CENTER-COMMERCIAL<br>SOURCE ORIENTED | MISSOULA<br>MISSOULA |
| 1100 031 G 07 | HEALTH DEPARTMENT ROOF, 301 W ALDER<br>MISSOULA COUNTY HEALTH DEPARTMENT | CITY CENTER-COMMERCIAL<br>QA-COLOCATED SAMPLER | MISSOULA<br>MISSOULA |
| 1300 001 F 01 | RAVALLI COUNTY COURTHOUSE - 205 BEDFORD<br>MONTANA AIR QUALITY BUREAU | CITY CENTER-COMMERCIAL<br>POPULATION ORIENTED | HAMILTON<br>RAVALLI |
| 1400 003 F 01 | SANDERS COUNTY COURTHOUSE<br>MONTANA AIR QUALITY BUREAU | CITY CENTER-COMMERCIAL<br>POPULATION ORIENTED | THOMPSON FALLS<br>SANDERS |

## TABLE 37a
## AQCR 144 - TOTAL SUSPENDED PARTICULATES
Micrograms per Cubic Meter

| County/City<br>Site Code | Site Name/Location | Yr | Num Obs | Max Obs | 2nd Max | 3rd Max | Arith Mean | Geom Mean |
|---|---|---|---|---|---|---|---|---|
| Flathead/Columbia Falls | | | | | | | | |
| 0270 003 F 01 | Columbia Falls Jr. High | 85 | 13 | 151 | 121 | 100 | 56.6 | 43.4 |
| 0270 005 F 01 | Anders Residence | 82 | 60 | 241 | 225 | 186 | 85.4 | 67.0 |
| | | 83 | 58 | 274 | 199 | 178 | 81.6 | 70.1 |
| | | 84 | 60 | 437 | 407 | 302 | 115.1 | 90.6 |
| | | 85 | 60 | 355 | 260 | 240 | 86.7 | 66.5 |
| Glacier Park | | | | | | | | |
| 0570 007 F 02 | Fire Weather Station | 82 | 47 | 51 | 46 | 42 | 15.9 | 12.3 |
| | | 83 | 52 | 40 | 35 | 30 | 13.0 | 9.2 |
| | | 84 | 48 | 129 | 58 | 49 | 15.3 | 9.0 |
| | | 85 | 55 | 48 | 44 | 41 | 15.5 | 12.1 |
| 0570 010 F 02 | St. Mary | 82 | 24 | 44 | 18 | 13 | 7.4 | 4.8 |
| | | 83 | 47 | 33 | 31 | 29 | 11.4 | 7.7 |
| | | 84 | 45 | 71 | 58 | 36 | 11.5 | 6.9 |
| | | 85 | 42 | 31 | 30 | 30 | 10.7 | 8.1 |
| Flathead/Kalispell | | | | | | | | |
| 0800 015 F 01 | Universal Athletic | 82 | 59 | 234 | 232 | 201 | 85.0 | 73.6 |
| | | 83 | 48 | 370 | 210 | 186 | 84.9 | 72.4 |
| | | 84 | 39 | 209 | 196 | 152 | 80.7 | 73.3 |
| | | 85 | 51 | 441 | 432 | 263 | 101.9 | 79.1 |

## TABLE 37b
## AQCR 144 - TOTAL SUSPENDED PARTICULATES
Micrograms per Cubic Meter

| County/City Site Code | Site Name/Location | Yr | Num Obs | Max Obs | 2nd Max | 3rd Max | Arith Mean | Geom Mean |
|---|---|---|---|---|---|---|---|---|
| Lincoln/Libby | | | | | | | | |
| 0900 010 F 01 | Brown Residence | 82 | 52 | 346 | 282 | 191 | 106.0 | 92.8 |
| | | 83 | 52 | 278 | 250 | 210 | 108.1 | 96.3 |
| | | 84 | 53 | 378 | 324 | 324 | 124.8 | 107.4 |
| | | 85 | 40 | 289 | 288 | 271 | 130.0 | 115.6 |
| 0900 012 F 01 | Lincoln County Courthouse | 83 | 50 | 278 | 207 | 207 | 106.1 | 90.4 |
| | | 84 | 54 | 463 | 364 | 354 | 121.7 | 102.5 |
| | | 85 | 56 | 642 | 438 | 392 | 122.2 | 99.6 |
| 0900 012 F 07 | Lincoln County Courthouse - Collocated | 84 | 16 | 281 | 194 | 142 | 114.6 | 103.1 |
| | | 85 | 53 | 638 | 471 | 407 | 132.7 | 107.2 |
| Lincoln/Eureka | | | | | | | | |
| 0940 005 F 01 | Lincoln Electric Co-op | 84 | 33 | 349 | 276 | 149 | 86.1 | 64.2 |
| | | 85 | 43 | 190 | 159 | 155 | 69.1 | 58.5 |
| Missoula/Missoula | | | | | | | | |
| 1100 015 G 02 | Hoerner Waldorf #1 | 82 | 113 | 101 | 86 | 70 | 31.9 | 26.3 |
| | | 83 | 104 | 80 | 69 | 68 | 29.5 | 25.8 |
| | | 84 | 114 | 94 | 92 | 85 | 26.7 | 21.7 |
| | | 85 | 100 | 111 | 91 | 87 | 33.6 | 28.3 |
| 1100 015 G 07 | Hoerner Waldorf #1 - Collocated | 82 | 45 | 65 | 64 | 63 | 32.0 | 27.5 |
| | | 83 | 58 | 78 | 67 | 65 | 29.0 | 25.2 |
| | | 84 | 60 | 54 | 52 | 49 | 25.0 | 21.5 |
| | | 85 | 45 | 76 | 70 | 63 | 33.3 | 29.6 |

## TABLE 37c
## AQCR 144 - TOTAL SUSPENDED PARTICULATES
Micrograms per Cubic Meter

| County/City Site Code | Site Name/Location | Yr | Num Obs | Max Obs | 2nd Max | 3rd Max | Arith Mean | Geom Mean |
|---|---|---|---|---|---|---|---|---|
| Missoula/Missoula | | | | | | | | |
| 1100 016 G 02 | Hoerner Waldorf #2 | 82 | 118 | 109 | 105 | 83 | 33.1 | 26.7 |
| | | 83 | 102 | 143 | 101 | 70 | 20.7 | 24.1 |
| | | 84 | 119 | 102 | 99 | 89 | 26.8 | 20.3 |
| | | 85 | 90 | 105 | 87 | 87 | 34.2 | 27.6 |
| 1100 020 G 01 | Rose Park | 82 | 351 | 381 | 312 | 221 | 64.6 | 55.2 |
| | | 83 | 347 | 422 | 346 | 280 | 67.7 | 55.9 |
| | | 84 | 346 | 294 | 264 | 257 | 64.5 | 53.6 |
| | | 85 | 338 | 340 | 261 | 243 | 63.9 | 53.1 |
| 1100 024 G 01 | Boyd Park | 82 | 116 | 319 | 309 | 298 | 89.2 | 72.9 |
| | | 83 | 139 | 366 | 336 | 321 | 88.3 | 72.7 |
| | | 84 | 341 | 440 | 408 | 343 | 70.7 | 56.5 |
| | | 85 | 315 | 309 | 301 | 289 | 76.5 | 62.5 |
| 1100 030 G 01 | Spurgin and Tower | 83 | 29 | 125 | 112 | 98 | 51.7 | 45.8 |
| | | 84 | 113 | 147 | 127 | 114 | 40.4 | 32.5 |
| | | 85 | 113 | 122 | 110 | 104 | 45.2 | 37.8 |
| 1100 031 G 02 | Health Department | 85 | 331 | 305 | 275 | 268 | 73.4 | 61.7 |
| 1100 031 G 07 | Health Department - Collocated | 85 | 100 | 227 | 204 | 188 | 67.9 | 57.8 |
| Ravalli/Hamilton | | | | | | | | |
| 1300 001 F 01 | Ravalli County Courthouse | 83 | 43 | 181 | 164 | 126 | 66.6 | 58.6 |
| | | 84 | 51 | 267 | 185 | 149 | 60.2 | 49.4 |
| | | 85 | 53 | 133 | 130 | 127 | 52.0 | 45.0 |

## TABLE 37d
## AQCR 144 - TOTAL SUSPENDED PARTICULATES
Micrograms per Cubic Meter

| County/City Site Code | Site Name/Location | Yr | Num Obs | Max Obs | 2nd Max | 3rd Max | Arith Mean | Geom Mean |
|---|---|---|---|---|---|---|---|---|
| Sanders/Thompson Falls | | | | | | | | |
| 1400 003 F 05 | Sanders County Courthouse | 83 | 45 | 358 | 260 | 257 | 89.8 | 72.3 |
| | | 84 | 47 | 388 | 370 | 360 | 106.7 | 81.0 |
| | | 85 | 48 | 604 | 362 | 362 | 108.3 | 81.0 |

TABLE 38a
AQCR 144 - TSP - Number of Exceedances
Micrograms per Cubic Meter

| County/City Site Code | Site Name/Location | Yr | Num Obs | Federal Prim Daily 260 | Federal Prim Annual G 75 | Federal Sec Daily 150 | Federal Sec Annual G 60 | Montana Std Daily 200 | Montana Std Annual A 75 |
|---|---|---|---|---|---|---|---|---|---|
| Flathead/Columbia Falls | | | | | | | | | |
| 0270 003 F 01 | Columbia Falls Jr. High | 85 | 13 | 0 | 0 | 1 | 0 | 0 | 0 |
| 0270 005 F 01 | Anders Residence | 85 | 60 | 2 | 0 | 7 | 1 | 4 | 1 |
| Glacier Park | | | | | | | | | |
| 0570 007 F 02 | Fire Weather Station | 85 | 55 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0570 010 F 02 | St. Mary | 85 | 42 | 0 | 0 | 0 | 0 | 0 | 0 |
| Flathead/Kalispell | | | | | | | | | |
| 0800 015 F 01 | Universal Athletic | 85 | 51 | 3 | 1 | 8 | 1 | 7 | 1 |
| Lincoln/Libby | | | | | | | | | |
| 0900 010 F 01 | Brown Residence | 85 | 40 | 3 | 1 | 14 | 1 | 4 | 1 |
| 0900 012 F 01 | Lincoln County Courthouse | 85 | 56 | 3 | 1 | 12 | 1 | 4 | 1 |
| Lincoln/Eureka | | | | | | | | | |
| 0940 005 F 01 | Lincoln Electric Co-op | 85 | 43 | 0 | 0 | 3 | 0 | 0 | 0 |
| Missoula/Missoula | | | | | | | | | |
| 1100 015 G 02 | Hoerner Waldorf #1 | 85 | 100 | 0 | 0 | 0 | 0 | 0 | 0 |

# TABLE 38b
## AQCR 144 - TSP - Number of Exceedances
Micrograms per Cubic Meter

| County/City Site Code | Site Name/Location | Yr | Num Obs | Federal Prim Daily 260 | Federal Prim Annual G 75 | Federal Sec Daily 150 | Federal Sec Annual G 60 | Montana Std Daily 200 | Montana Std Annual A 75 |
|---|---|---|---|---|---|---|---|---|---|
| Missoula/Missoula | | | | | | | | | |
| 1100 016 G 02 | Hoerner Waldorf #2 | 85 | 90 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1100 020 G 01 | Rose Park | 85 | 338 | 2 | 0 | 15 | 0 | 4 | 0 |
| 1100 024 G 02 | Boyd Park | 85 | 315 | 4 | 0 | 27 | 1 | 6 | 1 |
| 1100 030 G 01 | Spurgin and Tower | 85 | 113 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1100 031 G 02 | Health Department | 85 | 331 | 3 | 0 | 22 | 1 | 6 | 0 |
| Ravalli/Hamilton | | | | | | | | | |
| 1300 001 F 01 | Ravalli County Courthouse | 85 | 53 | 0 | 0 | 0 | 0 | 0 | 0 |
| Sanders/Thompson Falls | | | | | | | | | |
| 1400 003 F 05 | Sanders County Courthouse | 85 | 48 | 3 | 1 | 6 | 1 | 4 | 1 |

## TABLE 39a
## AQCR 144 - BETA (LIGHT) SCATTER
## Scattering Coefficient (X 10**5)

| Site Code | Site Name/Location | Yr | Mo | Num Obs | Max Obs | 2nd Max | 3rd Max | Monthly Average |
|---|---|---|---|---|---|---|---|---|
| 0900 013 F 05 | Libby - River | 83 | 01 | --- | --- | --- | --- | --- |
| | | | 02 | --- | --- | --- | --- | --- |
| | | | 03 | --- | --- | --- | --- | --- |
| | | | 04 | --- | --- | --- | --- | --- |
| | | | 05 | --- | --- | --- | --- | --- |
| | | | 06 | --- | --- | --- | --- | --- |
| | | | 07 | --- | --- | --- | --- | --- |
| | | | 08 | --- | --- | --- | --- | --- |
| | | | 09 | 414 | 36.6 | 34.5 | 33.2 | 8.8 |
| | | | 10 | 375 | 92.8 | 78.7 | 69.0 | 17.7 |
| | | | 11 | 599 | 61.7 | 59.5 | 58.2 | 18.4 |
| | | | 12 | 735 | 84.8 | 81.8 | 79.8 | 27.2 |
| | | ANNUAL | | 2123 | 92.8 | 84.8 | 81.8 | 19.4 |
| 0900 013 F 05 | Libby - River | 84 | 01 | 410 | 92.8 | 92.8 | 92.8 | 36.6 |
| | | | 02 | --- | --- | --- | --- | --- |
| | | | 03 | --- | --- | --- | --- | --- |
| | | | 04 | --- | --- | --- | --- | --- |
| | | | 05 | --- | --- | --- | --- | --- |
| | | | 06 | --- | --- | --- | --- | --- |
| | | | 07 | --- | --- | --- | --- | --- |
| | | | 08 | --- | --- | --- | --- | --- |
| | | | 09 | 578 | 68.5 | 64.5 | 58.5 | 11.8 |
| | | | 10 | 717 | 80.5 | 77.5 | 72.5 | 16.3 |
| | | | 11 | 698 | 81.5 | 77.5 | 74.5 | 24.9 |
| | | | 12 | --- | --- | --- | --- | --- |
| | | ANNUAL | | 2403 | 92.8 | 92.8 | 92.8 | 21.2 |

## TABLE 39b
## AQCR 144 - BETA (LIGHT) SCATTER
Scattering Coefficient (X 10**5)

| Site Code | Site Name/Location | Yr | Mo | Num Obs | Max Obs | 2nd Max | 3rd Max | Monthly Average |
|---|---|---|---|---|---|---|---|---|
| 0900 013 F 05 | Libby - River | 85 | 01 | --- | --- | --- | --- | --- |
| | | | 02 | --- | --- | --- | --- | --- |
| | | | 03 | --- | --- | --- | --- | --- |
| | | | 04 | --- | --- | --- | --- | --- |
| | | | 05 | --- | --- | --- | --- | --- |
| | | | 06 | --- | --- | --- | --- | --- |
| | | | 07 | --- | --- | --- | --- | --- |
| | | | 08 | --- | --- | --- | --- | --- |
| | | | 09 | 463 | 41.7 | 41.7 | 40.8 | 9.3 |
| | | | 10 | 733 | 69.2 | 55.6 | 53.8 | 15.5 |
| | | | 11 | 595 | 48.2 | 47.3 | 41.7 | 11.8 |
| | | | 12 | --- | --- | --- | --- | --- |
| | | ANNUAL | | 1791 | 69.2 | 55.6 | 53.8 | 12.6 |

## TABLE 40
## AQCR 144 - NITRATES
Micrograms per Cubic Meter

| County/City Site Code | Site Name/Location | Yr | Num Obs | Max Obs | 2nd Max | 3rd Max | Arith Mean |
|---|---|---|---|---|---|---|---|
| Glacier Park | | | | | | | |
| 0570 007 F 02 | Fire Weather Station | 82 | 47 | 1.0 | .8 | .7 | .3 |
| | | 83 | 52 | 2.0 | 1.0 | .9 | .4 |
| | | 84 | 48 | 1.8 | 1.7 | 1.0 | .4 |
| | | 85 | 55 | 1.7 | 1.7 | 1.4 | .5 |
| 0570 010 F 02 | St. Mary | 82 | 24 | 3.2 | 2.8 | 2.0 | .6 |
| | | 83 | 49 | 2.9 | 1.1 | 1.0 | .3 |
| | | 84 | 45 | 3.2 | 1.3 | .8 | .3 |
| | | 85 | 42 | 2.0 | 1.3 | .9 | .4 |

## TABLE 41
## AQCR 144 - SULFATES
Micrograms per Cubic Meter

| County/City Site Code | Site Name/Location | Yr | Num Obs | Max Obs | 2nd Max | 3rd Max | Arith Mean |
|---|---|---|---|---|---|---|---|
| Glacier Park | | | | | | | |
| 0570 007 F 02 | Fire Weather Station | 82 | 47 | 8.3 | 5.9 | 5.5 | 1.6 |
| | | 83 | 52 | 5.3 | 4.0 | 3.6 | 1.4 |
| | | 84 | 48 | 3.8 | 2.9 | 2.8 | 1.2 |
| | | 85 | 55 | 6.0 | 5.7 | 4.2 | 1.7 |
| 0570 010 F 02 | St. Mary | 82 | 24 | 7.3 | 5.6 | 5.2 | 2.0 |
| | | 83 | 49 | 6.2 | 4.2 | 3.0 | 1.4 |
| | | 84 | 45 | 7.3 | 2.4 | 2.2 | 1.0 |
| | | 85 | 42 | 6.0 | 3.0 | 2.9 | 1.2 |
| Missoula/Missoula | | | | | | | |
| 1100 015 G 02 | Hoerner Waldorf #1 | 82 | 114 | 16.5 | 9.2 | 7.2 | 2.3 |
| | | 83 | 107 | 6.0 | 5.8 | 5.6 | 3.2 |
| | | 84 | 113 | 11.0 | 9.9 | 9.7 | 3.2 |
| | | 85 | 98 | 14.5 | 13.5 | 9.9 | 4.1 |
| 1100 016 G 02 | Hoerner Waldorf #2 | 82 | 117 | 8.7 | 7.9 | 7.6 | 1.9 |
| | | 83 | 101 | 7.0 | 6.0 | 5.7 | 2.7 |
| | | 84 | 119 | 12.2 | 12.1 | 10.5 | 2.8 |
| | | 85 | 78 | 9.6 | 8.0 | 7.7 | 2.7 |
| 1100 020 G 01 | Rose Park | 82 | 119 | 9.8 | 7.7 | 7.4 | 2.6 |
| | | 83 | 20 | 7.6 | 6.4 | 5.4 | 3.5 |
| | | 84 | 78 | 10.3 | 7.5 | 6.8 | 3.7 |
| | | 85 | 107 | 10.7 | 9.1 | 8.3 | 3.1 |

## TABLE 42a
## AQCR 144 - CARBON MONOXIDE
Parts Per Million

| Site Code | Site Name/Location | Yr | Mo | Num Obs | Max Obs | 2nd Max | 3rd Max | 8 Hr Max | Monthly Average |
|---|---|---|---|---|---|---|---|---|---|
| 1100 024 G 01 | Boyd Park | 82 | 01 | 733 | 10.6 | 10.5 | 10.5 | 9.2 | 2.5 |
| | | | 02 | 463 | 13.4 | 11.3 | 10.1 | 8.4 | 2.5 |
| | | | 03 | 619 | 9.0 | 4.3 | 3.5 | 2.0 | .6 |
| | | | 04 | 702 | 3.4 | 3.3 | 3.0 | 2.2 | .7 |
| | | | 05 | 210 | 1.4 | .9 | .9 | .7 | .1 |
| | | | 06 | --- | --- | --- | --- | --- | --- |
| | | | 07 | --- | --- | --- | --- | --- | --- |
| | | | 08 | --- | --- | --- | --- | --- | --- |
| | | | 09 | --- | --- | --- | --- | --- | --- |
| | | | 10 | 105 | 3.8 | 3.6 | 3.1 | 2.0 | 1.1 |
| | | | 11 | 705 | 8.0 | 8.0 | 7.6 | 5.3 | 1.8 |
| | | | 12 | 543 | 9.5 | 8.0 | 7.9 | 6.2 | 1.5 |
| | | ANNUAL | | 4080 | 13.4 | 11.3 | 10.6 | 9.2 | --- |
| 1100 024 G 01 | Boyd Park | 83 | 01 | 734 | 15.1 | 14.5 | 13.2 | 9.3 | 2.5 |
| | | | 02 | 578 | 8.2 | 8.2 | 7.6 | 6.0 | 1.6 |
| | | | 03 | --- | --- | --- | --- | --- | --- |
| | | | 04 | --- | --- | --- | --- | --- | --- |
| | | | 05 | --- | --- | --- | --- | --- | --- |
| | | | 06 | --- | --- | --- | --- | --- | --- |
| | | | 07 | --- | --- | --- | --- | --- | --- |
| | | | 08 | --- | --- | --- | --- | --- | --- |
| | | | 09 | --- | --- | --- | --- | --- | --- |
| | | | 10 | --- | --- | --- | --- | --- | --- |
| | | | 11 | --- | --- | --- | --- | --- | --- |
| | | | 12 | --- | --- | --- | --- | --- | --- |
| | | ANNUAL | | 1312 | 15.1 | 14.5 | 13.2 | 9.3 | --- |

## TABLE 42b
## AQCR 144 - CARBON MONOXIDE
Parts Per Million

| Site Code | Site Name/Location | Yr | Mo | Num Obs | Max Obs | 2nd Max | 3rd Max | 8 Hr Max | Monthly Average |
|---|---|---|---|---|---|---|---|---|---|
| 1100 024 G 01 | Boyd Park | 84 | 01 | 666 | 16.5 | 15.0 | 14.8 | 13.3 | 2.5 |
| | | | 02 | 692 | 13.0 | 12.5 | 9.5 | 7.1 | 1.3 |
| | | | 03 | 732 | 9.7 | 8.0 | 6.3 | 3.3 | 0.3 |
| | | | 04 | 702 | 2.1 | 1.7 | 1.5 | 1.3 | 0.1 |
| | | | 05 | 737 | 2.7 | 2.1 | 1.6 | 1.1 | 0.2 |
| | | | 06 | 712 | 1.0 | 0.9 | 0.7 | 0.4 | 0.2 |
| | | | 07 | 519 | 1.1 | 0.7 | 0.7 | 0.2 | 0.0 |
| | | | 08 | 616 | 3.1 | 2.4 | 2.3 | 1.7 | 0.2 |
| | | | 09 | 714 | 3.8 | 3.6 | 3.4 | 2.6 | 0.5 |
| | | | 10 | 740 | 10.4 | 8.2 | 6.8 | 3.7 | 1.3 |
| | | | 11 | 710 | 9.1 | 8.3 | 7.3 | 5.5 | 1.6 |
| | | | 12 | 740 | 10.0 | 8.7 | 8.6 | 6.9 | 2.1 |
| | | ANNUAL | | 8280 | 16.5 | 15.0 | 14.8 | 13.3 | --- |
| 1100 024 G 01 | Boyd Park | 85 | 01 | 733 | 12.5 | 11.4 | 11.0 | 9.8 | 1.9 |
| | | | 02 | 639 | 11.6 | 10.8 | 8.6 | 7.5 | 1.8 |
| | | | 03 | 438 | 5.3 | 5.2 | 5.1 | 4.0 | 1.0 |
| | | | 04 | 443 | 2.3 | 2.1 | 2.0 | 1.6 | 0.5 |
| | | | 05 | 692 | 2.5 | 2.4 | 2.4 | 1.7 | 0.6 |
| | | | 06 | 82 | 0.1 | 0.0 | 0.0 | 0.0 | 0.0 |
| | | | 07 | --- | --- | --- | --- | --- | --- |
| | | | 08 | --- | --- | --- | --- | --- | --- |
| | | | 09 | --- | --- | --- | --- | --- | --- |
| | | | 10 | --- | --- | --- | --- | --- | --- |
| | | | 11 | --- | --- | --- | --- | --- | --- |
| | | | 12 | 710 | 14.9 | 12.6 | 12.0 | 11.0 | 2.9 |
| | | ANNUAL | | 3737 | 14.9 | 12.6 | 12.0 | 11.0 | --- |

## TABLE 43
## AQCR 144 - CO - Number of Exceedances
Parts per Million

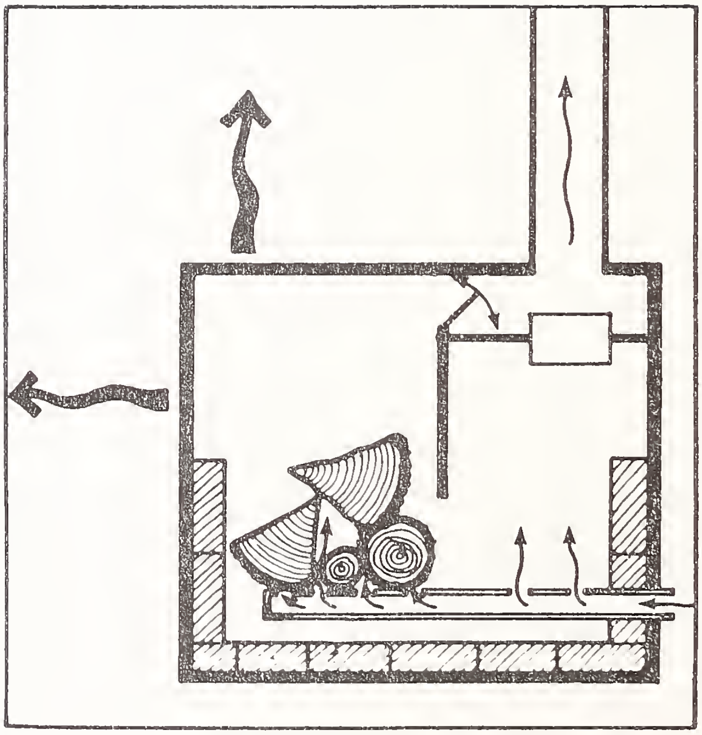
| County/City<br>Site Code | Site Name/Location | Yr | Num<br>Obs | Federal Prim<br>1-Hr<br>35 | <br>8-Hr<br>9 | Montana Std<br>1-Hr<br>23 | <br>8-Hr<br>9 |
|---|---|---|---|---|---|---|---|
| Missoula/Missoula | | | | | | | |
| 1100 024 G 02 | Boyd Park | 85 | 3737 | 0 | 3 | 0 | 3 |

## TABLE 44
## AQCR 144 - RESPIRABLE PARTICULATE (PM15)
Micrograms/Cubic Meter

| County/City Site Code | Site Name/Location | Yr | Num Obs | Max Obs | 2nd Max | 3rd Max | Arith Mean |
|---|---|---|---|---|---|---|---|
| Missoula/Missoula | | | | | | | |
| 1100 029 G 01 | Meadow Hills | 85 | 110 | 129 | 129 | 125 | 46.8 |
| 1100 031 G 02 | Health Department | 85 | 23 | 140 | 129 | 126 | 76.2 |

## TABLE 45
## AQCR 144 - RESPIRABLE PARTICULATE (PM10)
Micrograms/Cubic Meter

| County/City<br>Site Code | Site Name/Location | Yr | Num Obs | Max Obs | 2nd Max | 3rd Max | Arith Mean |
|---|---|---|---|---|---|---|---|
| Flathead/Columbia Falls | | | | | | | |
| 0270 003 F 01 | Columbia Falls Jr. High | 85 | 29 | 77 | 76 | 70 | 38.5 |
| Flathead/Kalispell | | | | | | | |
| 0800 015 F 01 | Universal Athletics | 85 | 20 | 77 | 68 | 68 | 47.6 |
| Lincoln/Libby | | | | | | | |
| 0900 012 F 01 | Lincoln Co. Courthouse | 85 | 26 | 114 | 114 | 98 | 58.6 |
| 0900 012 F 07 | Lincoln Co. Crthse. - Coll. | 85 | 31 | 157 | 112 | 98 | 58.0 |
| Missoula/Missoula | | | | | | | |
| 1100 020 G 01 | Rose Park | 84 | 22 | 142 | 109 | 107 | 51.7 |
| | | 85 | 13 | 257 | 135 | 134 | 94.0 |
| 1100 024 G 01 | Boyd Park | 84 | 20 | 138 | 127 | 116 | 57.3 |
| | | 85 | 5 | 90 | 87 | 76 | 66.2 |
| 1100 031 G 02 | Health Department | 85 | 24 | 140 | 129 | 126 | 76.0 |
| Sanders/Thompson Falls | | | | | | | |
| 1400 003 F 01 | Sanders Co. Courthouse | 85 | 26 | 89 | 85 | 84 | 48.5 |



# APPENDIX A

## Glossary of Air Quality Terms

# APPENDIX A

## GLOSSARY OF AIR QUALITY TERMS

ABSORPTION
(Engineering) The process of dissolving a gas or one of a mixture of gases in a liquid.
(Bio-medical) The taking up of fluids or other substances by the skin, mucous surfaces, or absorbent vessels.

ACID MIST
A mist of fine aqueous droplets which contain dissolved acidic compounds, such as sulfuric acid.

ACOUSTIC RADAR
A sounding device used to determine the mixing height.

ADIABATIC LAPSE RATE
The change of temperature with height of a parcel of dry air if it is lifted or lowered, with no loss or gain of heat.

ADSORPTION
The adhesion in an extremely thin layer of the molecules of gases or dissolved substances, or liquids, to the surfaces of bodies with which they are in contact.

AEROSOL
Suspended particulate matter consisting of smoke, dusts, and fumes which are either solid or droplets of liquids. Aerosol particles vary in size from well below one micron to approximately 100 microns in diameter.

AMBIENT AIR
That portion of the atmosphere, external to buildings, to which the general public has access.

AMBIENT AIR QUALITY
A physical and chemical measure of the concentration of various chemicals in the ambient atmosphere. The quality is usually determined over a specific time period.

ANTHRACITE
A type of a coal, hard, with high luster, which contains little volatile matter distinguishing it from bituminous coal.

AROMATIC
In organic chemistry, designating a large class of organic compounds which contain benzene rings. The simplest aromatic compound is benzene.

ASTM

ASTM (American Society for Testing Materials) is a voluntary organization of companies and individuals, established for the purpose of setting up standard methods of testing, so that different individuals can obtain comparable test results upon the same sample. ASTM standard test methods are available for almost all types of materials, including some air pollutants. An ASTM apparatus is the specific apparatus designated by ASTM for a specific test.

ATMOSPHERIC PRESSURE (Also called barometric pressure)

The pressure exerted by the atmosphere as a consequence of gravitational attraction exerted upon the "column" of air lying directly above the point in question. As with any gas, the pressure exerted by the atmosphere is ultimately explainable in terms of bombardment by gas molecules; it is independent of the orientation of the surface on which it acts.

Atmospheric pressure is one of the basic meteorological elements. It is measured by many varieties of barometer, and is expressed in several units. The most common unit used is the millibar (one millibar equals 1000 dynes per $cm^2$). Unique to the science of meteorology is the use of inches (or millimeters) of mercury; that is, the height of a column of mercury that exactly balances the weight of the column of atmosphere whose base coincides with that of the mercury column. Also employed are units of weight per area and units of force per area. A standard atmosphere has been defined in terms of equivalence to each of the above unit systems, and it is used as a unit itself.

ATTAINMENT AREA

A geographic area in which the quality of the air is better than federal air pollution standards. PSD requirements apply to attainment areas.

ATOMIZING SCRUBBER

A wet collector in which use is made of a liquid medium to increase the size of aerosol particles to facilitate its removal from a gas stream. In an atomizing scrubber, water is introduced at the throat of a venturi through which gas (containing aerosol particles) is moving at high velocity. Units of this type have a high pressure drop, and are used to get high removal efficiencies for particles of relatively small diameters (e.g., below 1.5 microns).

BACT - "Best Available Control Technology"

The term best available control technology means an emission limitation based on the maximum degree of reduction of each pollutant subject to regulation under this Act emitted from or which results from any major emitting facility, which the permitting authority, on a case-by-case basis, taking into account energy, environmental, and economic impacts and other costs, determines is achievable for such facility through application of production processes and available methods, systems and techniques, including fuel cleaning or treatment or innovative fuel combustion techniques for control of each such pollutant. [Clean Air Act, Section 169(3)].

BART - "Best Available Retrofit Technology"

An emission limitation based on the degree of reduction achievable through the application of the best system of continuous emission reduction for each pollutant which is emitted by an existing stationary facility. The emission limitation must be established, on a case-by-case basis, taking into consideration the technology available, the costs of compliance, the energy and nonair quality environmental impacts of compliance, any pollution control equipment in use or in existence at the source, the remaining useful life of the source, and the degree of improvement in visibility which may reasonably be anticipated to result from the use of such technology.

BAGHOUSE

An enclosure containing many cloth bag filters. Dust laden air entering at the top or bottom of a bag is discharged through the cloth directly to the atmosphere while the solid particles are deposited inside the bag.

BITUMINOUS

A type of coal, soft, which yields considerable volatile matter when heated. Burning this type of coal in open fireplaces or household stoves has caused serious air pollution problems (London, formerly in Pittsburgh and Saint Louis) because of the lack of sufficient temperature above the firebed to burn the volatilized gases and tars (i.e., both gaseous and particulate emissions).

BRONCHITIS

Inflammation of the bronchial tubes (wind pipe), which includes the bronchi (s. bronchus) and the choncia (s. bronchium) and through which air passes to the lungs.

BULK DENSITY

The quotient of the total mass of a mixture (usually liquid plus solid or gas plus solid) divided by the total volume.

CARBON DIOXIDE ($CO_2$)

A colorless, odorless, incombustible gas, used to make carbonated beverages, dry ice, etc. It is a product of respiration, combustion, fermentation, decomposition and other natural processes, and is always present in the atmosphere.

CASCADE IMPACTOR

A device for separating dust particles from a moving air stream. In principle a dust particle collides or impacts on a solid surface and thus is collected while the air stream moves around the solid surface. An assembly of a series of such surfaces is called a cascade impactor.

CHROMATOGRAPHY

A technique used by chemists to cause the separation of small amounts of chemical compounds in order to determine their identity and quantity.

CIRCULATION PATTERN

The general geometric configuration of atmospheric circulation at a given time and region.

CLASS I AREA

Any area which is designated for the most stringent degree of protection from future degradation of air quality. The Clean Air Act designates as mandatory Class I areas each national park over 6,000 acres and each national wilderness area over 5,000 acres.

CLASS II AREA

Any area cleaner than federal air quality standards which is designated for a moderate degree of protection from future air quality degradation. Moderate increases in new pollution may be permitted in a Class II area.

CLASS III AREA

Any area cleaner than federal air quality standards which is designated for a lesser degree of protection from future air quality degradation. Significant increases in new pollution may be permitted in a Class III area.

CLEAN AIR ACT

A law enacted by Congress to protect and enhance the quality of the nation's air resources so as to promote the public health and welfare and the productive capacity of its population.

CRITERIA POLLUTANT

A pollutant for which EPA has established a national ambient air quality standard under Section 109 of the Clean Air Act. Present criteria pollutants are: carbon monoxide, hydrocarbons, lead, nitrogen dioxide, ozone, sulfur dioxide and total suspended particulate.

CLOTH FILTER

A cloth bag filter; see BAGHOUSE

COLLECTION EFFICIENCY

The ratio of the weight fraction of aerosol which is retained in the collector to that which entered the collector. Collection efficiency could be specified in terms of particle numbers or other physical characteristics for special cases.

COMBUSTION

The rapid reaction of carbon containing substances (or other oxygen demanding materials) with oxygen producing a rapid temperature increase and a flame.

COMBUSTION CHAMBER

That part of a furnace or incinerator in which burning takes place.

CONING

A name which describes the approximate shape of a smoke plume in a neutral atmosphere (see FANNING).

CONVECTION

(In meteorology) a mechanical process thermally produced involving the upward and downward transfer of a limited portion of the atmosphere.

CYCLONE COLLECTOR

A device for separating solid particles from gases or liquids. The carrier gas or liquid is made to move in a rapid spiralling motion (cyclonic) throwing the solids by centrifugal force to the walls of the collector.

DEPOSITION VELOCITY

The minimum velocity of a small particle suspended in a moving air stream that will give the particle sufficient momentum to carry it into a target (deposit the particle on a collecting surface). At lower velocities the particle will remain in the air stream and go around the target.

DEW POINT (or dew point temperature)

The temperature to which a given parcel of air must be cooled at constant pressure and constant water vapor content in order for saturation to occur.

DISPERSION

The action of mixing air containing a high concentration of pollutants arising from a pollutant source with the ambient air thereby reducing the ambient pollutant concentration.

DUST COLLECTORS

Any device used to remove particulate matter from exhaust streams.

DUSTFALL

The amount of large particulate matter deposited per unit time per unit area of surface.

ELECTROLYTIC BATH

A container of liquid or molten materials through which an electric current is passed to cause chemical decomposition.

ELECTROSTATIC PRECIPITATOR

A device for collecting dispersed particles. Particle laden air is passed between two surfaces carrying a high electric potential and under the force of the electric field the particles are driven to a collecting electrode and precipitated.

EMPHYSEMA

The presence of air in the alveolar tissue of the lungs due to rupture of the alveoli. Progressive development of this condition leads to enlargement of the lungs and the chest cavity simultaneously with reduced capacity for breathing and efficiency of breathing.

FANNING
The characteristic appearance of a smoke plume emitted under extreme inversion conditions, where little vertical mixing of smoke in the atmosphere takes place (see CONING).

FLUE GASES
All the gases discharged from any stationary combustion process.

FLUE GAS DESULFURIZATION
One of several processes by which sulfur dioxide is removed from the flue gas as a disposal solid, elemental sulfur or sulfuric acid.

FLUORIDE
The generic name of all simple chemical compounds containing fluorine, as sodium fluoride.

FLUORINE
A nonmetallic chemical element, a pale yellow, highly corrosive and toxic gas.

FLUOROSIS
Chronic poisoning by fluorides.

FLY ASH
The non-combustible particles contained in flue gas.

FOSSIL FUELS
Oil, coal or natural gas.

FREE LIFT
The actual lifting force of an inflated balloon, usually expressed in grams. The free lift plus the weight of the balloon and attached equipment is the total lift.

FUME
A fume is formed by sublimation of solid particles from the gaseous state. The term is frequently used to describe suspensions of very small (submicron) particles.

GASIFICATION
The process of converting solid or liquid fossil fuels to gaeous fuel, usually with the elimination of sulfur.

GRAVITY SETTLING
The application of gravitational force to cause solid particles to drop out of the air. Practically it is useful for removing only particles larger than 50 microns in size.

HALOGEN
Any of the five very active, nonmetallic chemical elements: fluorine, chlorine, bromine, iodine, and astatine.

HYDROCARBON

Any of the class of compounds consisting solely of hydrogen and carbon.

1. Paraffins whose molecules contain the maximum possible of hydrogen.
2. Aromatics, whose molecules contain benzene rings.
3. Naphthenes, whose molecules are ring shaped.
4. Olefins, whose molecules contain double bonds.

HYDROFLUORIC ACID

A water solution of hydrogen fluoride. In the gaseous state, hydrogen fluoride is colorless, corrosive, and poisonous.

HYDROGEN

The most simple chemical element and the lightest of all gases. It is found chiefly combined with oxygen to form water; also found in acids, bases, hydrocarbons, etc.

INCINERATORS

Any device to burn solid and combustible liquid residues or wastes in order to reduce their bulk. The ash residue may be used for landfill or dumped at sea. Flue fed incinerators are those where the garbage or refuse is supplied to the combustion chamber through the same flue used for discharge of the products of combustion. A power generating or combination incinerator is one in which the heat from refuse combustion is used to generate steam. Primary air is usually supplied with the material being burned. Secondary air is usually supplied to complete combustion of incompletely burned gaseous fractions over the fuel bed. Tertiary air may be supplied to further improve combustion in a secondary chamber.

INCREMENTS

The amount of additional pollution, beyond already existing background levels, which may be allowed in a particular PSD area. The size of allowable increment varies with whether the area is Class I, Class II or Class III.

INVERSION

A meteorological condition in which the temperature of the atmosphere rises with increased elevation instead of falling; a negative temperature lapse rate.

INVERSION LAYER

A layer in the atmosphere through which the temperature remains constant or increases with altitude.

ICAP - Inductive Coupled Argon Plasma

Measurement of emission spectra which is excited by radiofrequency in a plasma. The emissions from analytes will produce signals on a photomultiplier tube.

INTEGRAL VISTA

A view perceived from within the mandatory Class I Federal area of a specific landmark or panorama located outside the boundary of the mandatory Class I federal area.

ISOKINETIC

Having the same speed and direction. When sampling gas streams for certain purposes it is important that the gas flow into the sampler be of the same speed and direction as the main gas stream. This is called isokinetic sampling.

LAER - Lowest Achievable Emission Rate

A requirement applying to proposed new or modified major stationary sources in nonattainment areas. LAER means the rate of emissions which reflects:

a. The most stringent emission limitation which is contained in the (SIP) of any state for such class or category of source.... or
b. the most stringent emission limitation which is achieved in practice..., whichever is more stringent.

LAPSE RATE

The change in an atmospheric variable, usually temperature, with height.

LIGNITE

A naturally occurring coal-like material often having a distinct woody texture.

MACROMETEOROLOGY

Large-scale weather events as opposed to local micrometeorological events.

MERCAPTAN

One of a class of sulfur-containing organic chemical compounds (R-SH), which have an extremely offensive odor.

METEOROLOGY

The science dealing with the atmosphere and its phenomena, particularly relating to weather.

METHANE

The first of the series of hydrocarbons (CH). It is a colorless, odorless, flammable gas and is the chief constituent of natural gas.

MICROMETEOROLOGY

The science of small-scale weather events.

MICRON (MU)

A metric unit of measure of length equal to one millionth of a meter and to one thousandth of a millimeter. This unit is often used for describing sizes of airborne particles and is commonly designated by the Greek letter u (mu).

MIXING HEIGHT (or mixing depth)

The thickness of the atmospheric layer, measured from the surface upward, through which pollutants are presumed to mix by virtue of convection caused by daytime heating at the surface. The designation of mixing height implies the existence of an inversion, in which case the mixing height is also the height of the inversion base.

NECROSIS

Gradual decay in trees or plants.

NESHAPS - National Emission Standards for Hazardous Pollutants

EPA has adopted emission standards for sources of asbestos, beryllium, vinyl chloride, and mercury.

NITROGEN OXIDES

Compounds of nitrogen including $N_2O$, NO, $NO_2$, $NO_3$, $N_2O_3$, $N_2O_4$, $N_2O_5$. Those most commonly encountered in the atmosphere are nitrous oxide ($N_2O$), a normal constituent of the air, and nitric oxide (NO) and nitrogen dioxide ($NO_2$) which are classified as pollutants.

NONATTAINMENT AREA

A geographic area in which the quality of the air is worse than federal air pollution standards. PSD requirements do not apply in nonattainment areas.

NSPS - New Source Performance Standards

EPA emission standards for certain categories of new or modifed air pollutant sources.

OPACITY

A measurement of visible emissions defined as the degree, expressed in percent, to which emissions reduce the transmission of light and obscure the view of an object in the background.

OXIDANT

Any chemical element or compound which will cause any other element to increase in positive valence in a chemical reaction. Less precisely, any chemical element or compound, e.g. $NO_2$, including oxygen, which has the same effect as oxygen in a chemical reaction. In photochemical smog, the sum of all compounds detected by reaction with reducing agent, e.g., potassium iodide solution.

OZONE

A form of oxygen, $O_3$, having three atoms of oxygen to the molecule. It is found in the atmosphere in minute quantities and is a powerful oxidizing agent. It is a toxic constituent of photochemical smog.

PARAFFINS

A class of saturated hydrocarbons characterized by their chain-like molecular structure. See HYDROCARBON.

PARTICLES

Any solid matter emitted by a pollutant source. It is composed of settleable matter (which will settle as dust within a reasonable period of time) and suspended matter (which remains suspended in the atmosphere until washed out by precipitation, deposited by impaction, or some other process).

PARTICULATE MATTER

Finely divided solids or liquids. See AEROSOL.

PHOTOCHEMICAL SMOG

Air pollution resulting from light-induced reaction between certain organic materials and nitrogen dioxide.

PILOT BALLOON

A small balloon whose ascent is followed by a theodolite in order to obtain data for the computation of the speed and direction of winds in the upper air.

PILOT-BALLOON OBSERVATION (Commonly pibal)

An observation method for winds aloft; that is, the determination of wind speeds and directions in the atmosphere above a station. This is done by reading the elevation and azimuth angles of a theodolite while visually tracking a pilot balloon.

The ascension rate of the balloon is approximately determined by careful inflation to a given total lift. After release from the ground, periodic readings (usually at one-minute intervals) of elevation and azimuth angles of the balloon are recorded. These data are transferred to a winds-aloft plotting board, and the wind speed and direction at selected levels are calculated by trigonometric methods.

PREVAILING WIND DIRECTION (or prevailing wind)

The wind direction most frequently observed during a given period. The periods most frequently used are the observational day, month, season and year.

PSD - Prevention of Significant Deterioration

A planning and management process under Sections 160 through 169 of the CAA for allocation and use of air resources.

RADIATION INVERSION

A type of atmospheric inversion occurring usually at night when the earth's surface loses heat by radiation, thus cooling the layer of air next to the ground. See INVERSION.

RESIDUAL FUEL OIL

The remainder after the more valuable petroleum gas, gasoline, lubricants, paraffin waxes and asphalt are removed from petroleum. This heavy oil is used as fuel and is graded number 4, 5, or 6, with the heavier grades bearing higher numbers. These grades are also cheaper and usually contain more sulfur. The amount of sulfur in the "RESID" depends on the feed stock (source of the crude oil) and the use of dehydrosulfurization processes.

RINGLEMANN CHART
A chart showing four numbered shades of gray as well as pure white and all black, used by visual comparison for estimating the density of smoke as it emerges from a stack. The matched comparison with the chart is referred to as a Ringlemann number.

SCATTERING COEFFICIENT
Amount of back scatter of light due to suspended particulate matter in the air and relates the measurement to visibility and the level of particulates.

SCRUBBER
Any device in which an aerosol is removed from a gas stream by a liquid droplet.

SETTLING CHAMBER
A simple particulate control device which consists of a large expansion in a flue or duct which results in a reduced pollutant velocity and subsequent particulate settling. The settled particulate is then mechanically removed from the chamber.

SETTLING VELOCITY
The speed at which an object will move through its surroundings under the force of gravity.

SIP - State Implementation Plan
A state developed, federally approved plan for implementing and enforcing requirements of the CAA.

SMOG
A combination of smoke and fog, usually generated as a result of atmospheric contamination. London (England) type smog arises as a result of the combined presence of sulfur oxides and particulates in a humid environment. Los Angeles smog or photochemical smog occurs when sunlight generated reactions involving hydrocarbon, ozone and nitrogen oxide take place. The smog is most visible when high concentrations of water vapor occur in the atmosphere simultaneously but may appear as a bluish haze in a dry atmosphere.

SOLAR RADIATION
The total electromagnetic radiation emitted by the sun.

SOOT
Aggregated particles of unburned carbon produced by incomplete combustion. The soot may contain sufficient amounts of sulfur oxides or compounds to damage paint or enamel finishes.

**SPRAY CHAMBER**

The simplest type of gas scrubber. Gas is passed countercurrent to falling drops of liquid (usually water) from a bank of spray nozzles. A typical appliction is the removal of fly ash and cinders from flue gases.

**STABLE**

Pertaining to the atmosphere or an atmospheric layer in the condition of static stability, that is, an atmosphere whose temperature lapse rate and moisture distribution is such as to suppress vertical exchange of air.

**STAGNATION**

With respect to air pollution, the persistence of a given volume of stable air over a region, permitting an abnormal buildup of pollutants from sources within the region.

**STATIC STABILITY** (Also called hydrostatic stability, vertical stability, convective or convectional stability)

The state of the atmosphere when it is stable relative to vertical displacements. Such an atmosphere tends to remain stratified, in that any air that is displaced vertically is subjected to a buoyant force that tends to restore it to its original level.

Static stability is determined primarily by the temperature lapse rate; an inversion layer is an extreme example of a statically stable layer.

**STOICHIOMETRIC**

In the exact combining proportions of materials involved in a specific chemical reaction.

**SUBSIDENCE INVERSION**

An atmospheric inversion due to the downward motion or air, about a stationary high-pressure area with concomitant adiabatic temperature rise. Such an inversion is common to Southern California in the warm months of the year. See INVERSION.

**SURFACE INVERSION** (or ground inversion)

A temperature inversion based at the earth's surface; that is, an increase of temperature with height beginning at the ground level.

This condition is due primarily to greater loss of heat due to radiation at and near the surface than at levels above. Thus, surface inversions are common over land prior to sunrise and in winter over high-latitude continental interiors.

**SYNERGISM**

Cooperative action of discrete pollutants such that the total effect is greater than the sum of the two effects taken independently.

TEMPERATURE INVERSION

A layer in which temperature increases with altitude. The principal characteristic of an inversion layer is its marked static stability, so that very little turbulent exchange can occur within it. Strong wind shears often occur across inversion layers, and abrupt changes in concentrations of atmospheric particulates and atmospheric water vapor may be encountered on ascending through the inversion.

When, in meteorological literature and discussion an "inversion" is mentioned, a temperature inversion is usually meant.

THEODOLITE

An optical instrument which consists of a sighting telescope mounted so that it is free to rotate around horizontal and vertical axis and graduated scales so that the angles or rotation may be measured. The telescope is usually fitted with a right-angle prism so that the observer continues to look horizontally into the eyepiece, whatever the variation of the elevation angle. In meteorology, the theodolite is used principally to observe the motion of a pilot balloon.

TOTAL LIFT

The upward force produced by the gas in a balloon. It is equal to the sum of the free lift, the weight of the balloon, and the weight of auxiliary equipment carried by the balloon.

WET COLLECTORS

Dust collectors which operate by contacting the dust with a liquid (usually water). The class includes spray chambers and atomizing scrubbers.

WIND

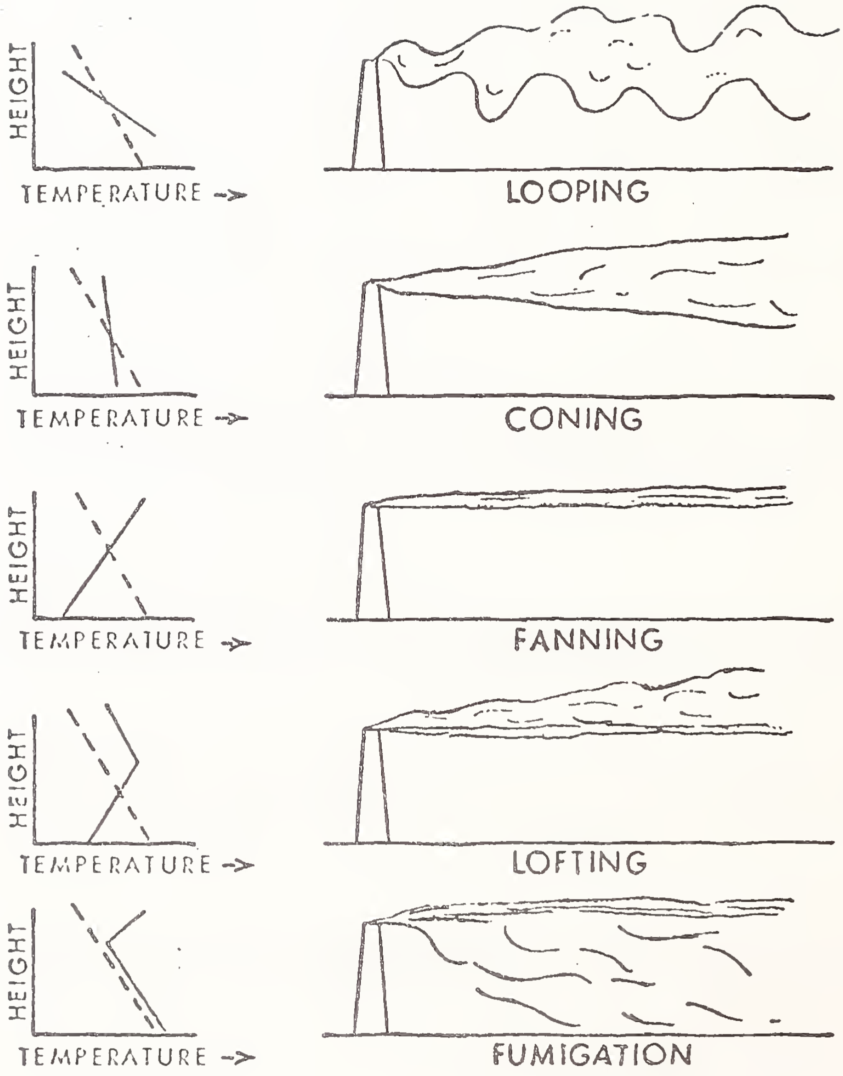
Air in motion relative to the surface of the earth. Since vertical components of atmospheric motion are relatively small, especially near the surface of the earth, meteorologists use the term to denote almost exclusively the horizontal component. Vertical winds are always identified as such.

WIND ROSE

A diagram showing the wind direction and speed and their variations for a day, a month, or any other specified period of time, for a specific location and altitude.

WIND VANE

An instrument used to indicate wind direction.


HEIGHT
TEMPERATURE ->
LOOPING
HEIGHT
TEMPERATURE ->
CONING
HEIGHT
TEMPERATURE ->
FANNING
HEIGHT
TEMPERATURE ->
LOFTING
HEIGHT
TEMPERATURE ->
FUMIGATION

# APPENDIX B

## Ambient Air Quality Standards

# APPENDIX B

## AMBIENT AIR QUALITY STANDARDS

In December, 1977, the Montana Board of Health and Environmental Sciences directed the Air Quality Bureau to propose an administrative rule containing new enforceable ambient air quality standards.

A set of standards had been on the books for ten years; however, they were considered as goals or guidelines rather than enforceable standards.

It was decided that before new standards were adopted there should be a thorough review to determine whether the old standards were still appropriate or whether scientific research completed since their adoption indicated different standards were necessary.

Subsequently, $147,000 was provided to hire a staff and consultants. This study was called the Montana Ambient Air Quality Standards Study (MAAQS).

As a result of this work a draft environmental impact statement was published in January, 1979; a final statement in February, 1980.

After several public hearings and testimony from numerous "experts", the Board of Health and Environmental Sciences adopted a set of "enforceable" standards in August, 1980. Table AP-B-I lists the Montana and national ambient air quality standards. Additional information about the standards is provided on the following page.

## Table AP-B-I

## MONTANA AND NATIONAL AIR QUALITY STANDARDS

| POLLUTANT | MONTANA STANDARD | FEDERAL PRIMARY STANDARD | FEDERAL SECONDARY STANDARD |
|---|---|---|---|
| Total Suspended Particulates | 75 ug/m$^3$ annual average<br>200 ug/m$^3$ 24-hr average* | 75 ug/m$^3$ annual geo. mean<br>260 ug/m$^3$ 24-hr average* | 60 ug/m$^3$ annual geo. mean<br>150 ug/m$^3$ 24-hr average* |
| Sulfur Dioxide | 0.02 ppm annual average<br>0.10 ppm 24-hr average*<br>0.50 ppm 1-hr average** | 0.03 ppm annual average<br>0.14 ppm 24-hr average* | 0.5 ppm 3-24 average* |
| Carbon Monoxide | 9 ppm 8-hr average*<br>23 ppm hourly average* | 9 ppm 8-hr average*<br>35 ppm 1-hr average* | 9 ppm 8-hr average* |
| Nitrogen Dioxide | 0.05 ppm annual average<br>0.30 ppm hourly average* | 0.05 ppm annual average | 0.05 ppm annual average |
| Photochemical Oxidants (ozone) | 0.10 hourly average* | 0.12 ppm 1-hour average* | 0.12 ppm 1-hr average* |
| Lead | 1.5 ug/m$^3$ 90-day average | 1.5 ug/m$^3$ calendar qtr. avg. | None |
| Foliar Fluoride | 35 ug/g grazing season avg.<br>50 ug/g monthly average | None | None |
| Hydrogen Sulfide | 0.05 ppm hourly average* | None | None |
| Settled Particulate (Dustfall) | 10 gm/m$^2$ 30-day average | None | None |
| Visibility | Particle scattering coefficient of 3 x $10^{-5}$ per meter annual average*** | None | None |

ug/m$^3$ = micrograms pollutant per cubic meter of sampled air.
ppm = parts pollutant per million parts of sampled air.
*Not to be exceeded more than once per year.
**Not to be exceeded more than 18 times per year.
***Applies to PSD mandatory Class I areas.

Air quality standards have been developed at the national level for six classes of air pollutants and at the state level for nine pollutants plus visibility. Below is a synopsis of each of the pollutants.

Sulfur Dioxide - Sulfur dioxide originates from the burning of fossil fuels such as coal or oil and the smelting of metals ores. The pollutant is known for causing significant loss in crop yield, rusting metals, reducing visibility, and causing irritation of eyes, nose, throat, and lungs.

Particulate Matter - Particulate matter may originate from natural sources such as forest fires and erosion, or result from automobiles, industrial processes, unpaved roads, agriculture, construction, and other human activities. These tiny particles can damage paint, reduce visibility, and carry poisonous chemicals into the lungs causing cellular damage.

Carbon Monoxide - Carbon monoxide is a by-product of the incomplete combustion of organic fuels. The most notorious source is the automobile. This odorless gas can, in small amounts, cause headaches, dizziness, fatigue, and slow reactions. It can be especially dangerous for people with heart disease. In larger amounts it can cause death.

Photochemical Oxidants (Ozone) - Photochemical oxidants are produced in the atmosphere when hydrocarbons and nitrogen oxides, combustion wastes from gasoline and other fuels, are exposed to sunlight. Oxidants irritate the eyes, nose, and throat, make breathing difficult, reduce visibility, and damage vegetation.

Hydrocarbons - Hydrocarbons are the unburned chemicals from the combustion or evaporation of organic compounds. Automobile exhaust and uncontained storage of petroleum products are common sources of hydrocarbons. They have been known to cause vegetative damage and contribute to photochemical oxidants.

Nitrogen Oxides - Nitrogen oxides usually originate in high-temperature combustion processes including diesel engines. It is not only a component of photochemical oxidants, but causes an unpleasant smelling brown haze, and is irritating to the nose and throat.

Fluoride - Sources of fluorides include the aluminum, glass, brick, fertilizer and, to a small degree, the oil industries. In excessive amounts, fluorides can cause bone deformities and damage vegetation.

Lead - Lead in the air is generally the result of automobiles and ore smelters. Physical problems of high lead content include gastrointestinal cramps, central nervous system effects, kidney disease, and anemia.

Hydrogen Sulfide - Sources of hydrogen sulfide, the "rotten egg" pollutant include sewage treatment, kraft pulp, and oil industries. The pollutant can damage paint, tarnish copper, injure vegetation, produce a loss of the sense of smell, cause severe respiratory tract irritation, and in large doses, cause death.

Visibility - Visibility reductions are due to the amounts of TSP, aerosols, and gases present in the atmosphere.

# APPENDIX C

## Attainment
## Nonattainment
## Designations

# APPENDIX C

## ATTAINMENT-NONATTAINMENT DESIGNATIONS

### INTRODUCTION

The 1977 Clean Air Act Amendments, enacted by Congress August 7, 1977, contained many new and expanded requirements regarding the control of air pollution. One of the most significant requirements was to classify areas of the state according to whether they met the National Ambient Air Quality Standards (NAAQS). The department classified each area of the state into one of three categories: attainment - meeting the standards, nonattainment - exceeding the standards, or unclassified - insufficient information to determine the status. The areas which were designated nonattainment were required to develop revised State Implementation Plans to control emissions and bring the areas into compliance.

### Classification Requirements

Five classifications were possible - three for particulate matter (PM) and sulfur dioxide ($SO_2$) and two for pollutants other than particulate matter or sulfur dioxide. The five classifications are summarized below.

A) Do not meet a national primary ambient air quality standard for oxidants, carbon monoxide (CO) or nitrogen dioxide ($NO_2$).

B) Do not meet, or in the judgment of the State will not attain or maintain in the time required by the applicable SIP, any national primary ambient air quality standard for sulfur dioxide or particulate matter.

C) Do not meet a national secondary ambient air quality standard.

D) Cannot be classified as B or C, on the basis of available information, for PM or $SO_2$.

E) Have ambient air quality levels better than any national primary or secondary ambient air quality standard for oxidants, CO or $NO_2$, or for which there is insufficient data to be classified A or C.

Areas designated as A, B or C were referred to as nonattainment areas, and areas designated as D or E were referred to as attainment (or unclassified) areas.

### Air Quality Data

The department used, whenever possible, the last four consecutive quarters of air quality data to propose the designations. Data was available from two ozone sites, two nitrogen oxides sites, three carbon monoxide sites, eleven sulfur dioxide sites, and fifty total suspended particulate sites.

## Designation Proposal

On January 6, 1978, the department submitted to EPA a proposed attainment/nonattainment designation document. The table which follows is a summary of that document. It should be noted that rural areas (less than 50,000 pop.) with high total suspended particualte concentrations were not designated nonattainment if the primary cause of the violations was uncontaminated (non-industrial) fugitive dust.

### TABLE AP-C-I

### ATTAINMENT STATUS

1. Oxidants

   The department proposed that the entire state be unclassified for oxidants.

2. Nitrogen Oxides

| | Designation | | |
|---|---|---|---|
| Designated Area | 107(d)(1)(A) Nonattainment | 107(d)(1)(E) Unclassified | 107(d)(1)(E) Attainment |
| Billings, MT area | | | * |
| Colstrip, MT | | | * |
| Butte, MT | | * | |
| Rest of State | | * | |

3. Carbon Monoxide

| | Designation | | |
|---|---|---|---|
| Designated Area | 107(d)(1)(A) Nonattainment | 107(d)(1)(E) Unclassified | 107(d)(1)(E) Attainment |
| Billings Downtown Area | * | | |
| Butte Area | | * | |
| Colstrip Area | | * | |
| Great Falls | | * | |
| Missoula Area | * | | |

TABLE AP-C-I (Continued)

ATTAINMENT STATUS

4. Sulfur Dioxide

| | Designation | | |
|---|---|---|---|
| | Nonattainment | | |
| Designated Area | 107(d)(1)(B) Primary | 107(d)(1)(C) Secondary | 107(d)(1)(D) Not B or C |
| Laurel Area | * | | |
| East Helena Area | * | | |
| Billings | | | * |
| Colstrip Area | | | * |
| Rest of State | | | * |

5. Total Suspended Particulate

| | Designation | | |
|---|---|---|---|
| | Nonattainment | | |
| Designated Area | 107(d)(1)(B) Primary | 107(d)(1)(C) Secondary | 107(d)(1)(D) Not B or C |
| Decker | | | * |
| Hardin | | | * |
| Billings Downtown | | * | |
| Billings Area | | | *(1) |
| Great Falls CBD | | * | |
| Great Falls Area | | | *(2) |
| Butte Area | | * | |
| Philipsburg | | | *(1) |
| East Helena | | * | |
| Three Forks | | | *(1)(2) |
| Miles City | | | * |

TABLE AP-C-I (Continued)

ATTAINMENT STATUS

| Designated Area | Designation<br>Nonattainment<br>107(d)(1)(B)<br>Primary | <br><br>107(d)(1)(C)<br>Secondary | <br>107(d)(1)(D)<br>Not B or C |
|---|---|---|---|
| Ekalaka | | | *(2) |
| Fort Peck | | | * |
| Lame Deer | | | * |
| Scobey | | | * |
| Glendive | | | * |
| Colstrip | | * | |
| Broadus | | | *(1) |
| Lindsay | | | *(1) |
| Poplar | | | * |
| Columbia Falls | * | | |
| Kalispell | | | *(1) |
| Libby | | | * |
| Troy | | | * |
| Missoula Area | * | * | |

(1) Violation of standard due to fugitive dust from non-industrial sources - unpaved roads, etc.
(2) Insufficient data from which to classify the area.

## Revisions/Considerations of the Original Designation Proposal

Soon after the department submitted its original proposal in 1978, new data indicated other areas were violating standards. In the years that followed, plans and considerations to the original proposal have developed. The following discusses some of the revisions and considerations of the original designation proposal.

1. Billings - TSP

Billings was designated as non-attainment for total suspended particulates. The TSP plan was approved on March 4, 1980 (45 FR 14036). The secondary standard for TSP is nearing attainment as a result of extensive street sweeping and flushing programs.

2. Billings - CO

Billings was also designated as nonattainment for carbon monoxide. The plan for attainment of the 8-hour CO standard predicted that a modification of the Exposition Drive-First Avenue North intersection would achieve the standards. A proposal to approve the plan appeared on July 23, 1984 (49 FR 29620). Final approval was given on January 16, 1986, (51 FR 2397).

Data collected during two years following the modification to Exposition Drive indicates compliance with the standards. The department will submit a request for designation to attainment some time in the future.

3. Butte - TSP

Soon after the Department submitted its proposal, additional data from Butte indicated the area was violating primary standards for total suspended particulates. As a result, EPA immediately promulgated a nonattainment designation for Butte for violation of the primary standard.

The original SIP called for attaining the standard through enforcement of the airborne particulate rule. The Department of Health and Environmental Sciences and Department of Highways were to develop a set of emission factors for paved and unpaved roads and apply these factors to the appropriate streets in the Butte area. As it turned out, the development of these factors proved impossible. The Department turned its attention to developing a control plan in conjunction with the Anaconda Minerals Company (ARCO) and the city of Butte.

A plan which called for a permit from ARCO and street paving and sweeping by the City of Butte was developed and approved by the Board of Health. The plan was submitted to EPA in February 1983. EPA has made several inquiries into the plan regarding attainment of the short-term standard. The state has submitted information showing that the short-term standard was never exceeded in Butte through 1984. EPA apparently will only designate the area attainment for the primary standard since the modeling submitted did not show attainment of the secondary standard.

No formal action has been taken in the Federal Register since the department submitted a request for attainment in 1983.

4. Colstrip - TSP

Colstrip was designated as nonattainment for TSP in 1978. The control strategy involved a permit for the nearby coal mines. Such a permit was evaluated and issued according to the plan.

EPA proposed to approve the plan on July 5, 1983, (48 FR 30696) and then again on July 23, 1984, (49 FR 29620). The plan was finally approved on April 26, 1985, (50 FR 16475).

Montana, in cooperation with Montana Power Company, Western Energy Company, and Peabody Coal Company, prepared a redesignation request. The request was submitted to EPA and given final approval on April 26, 1985, (50 FR 16475). The change in status from nonattainment to attainment applies only to the primary standard. The area remains nonattainment for the secondary TSP standard.

5. Columbia Falls - TSP

Columbia Falls was designated as non-attainment for total suspended particulates based upon the Anders monitoring site. The control strategy for this area involved the rebuilding of Highway 40 and Nucleus Avenue through Columbia Falls. The paving project for Nucleus was completed in late fall, 1982. Highway 40 was finished in fall, 1984. Data to date does not exhibit a clear pattern. The readings had been dropping as a result of the SIP, but other factors may now be influencing the site.

6. East Helena - TSP

East Helena was designated as a non-attainment area for total suspended particulates based upon the Hastie monitoring site. No special control strategy was implemented since the emission inventory demonstrated over 50% of the particulate emissions were from near-by highway construction In addition, ASARCO agreed to reduce TSP emissions from slag piles by spraying the piles with water or other coating material. The data from Hastie for years 1981-85 indicate compliance with primary and secondary standards. The data for the Hadfield and Firehall sites, however, are slightly higher. These data indicate exceedances of the secondary standard in 1985. A request for redesignation will probably await the final results of the provisions of the lead SIP.

7. East Helena - $SO_2$

East Helena was designated non-attainment for sulfur dioxide in 1977. The ASARCO smelter installed an acid plant with several modified stacks to reduce the sulfur dioxide emissions. DAta for the past five years shows no violations of national or Montana ambient air quality standards. The department submitted a request for redesignation, but final approval has hinged on proper approavl of the stack height regulations.

8. Great Falls - TSP

The Great Falls area was designated nonattainment of the secondary standard for total suspended particulates. The city has instituted a sweeping/flusing program to control particulate emissions. Data for 1983 indicate compliance with the secondary standard while 1982, 1984, and 1985 show exceedances of the secondary standard.

9. Great Falls - CO

A corridor along 10th Ave. South was designated as nonattainment for carbon monoxide in September, 1980. The Great Falls City-County Planning Agency was designated as the lead agency to develop a SIP. The plan was developed in conjuction with the Highway Department and Air Quality Bureau. The plan shows that an improvement in automobile emissions as a result of EPA-mandated emission standards and reductions at the Montana Refining Company (formerly Phillips Petroleum Company) will bring the area into compliance by the end of 1985 or 1986. In addition to the improvements in automobiles, the city has completed a number of projects such as improved traffic synchronization, widening of the Warden Street bridge, and a new mass transit system which should assure attainment.

During the review process, it was discovered that emission reductions planned at the Montana Refining Company (formerly Simmons) never occurred. The department discussed this matter with Montana Refining and a compromise solution was worked out. This reduced the base year emissions from 10,000 tons/year to approximately 4,700. The revised plan was approved by the board on March 7, 1986, and subsequently submitted to EPA on March 28, 1986. EPA has taken no formal action on the revised plan.

10. Missoula - TSP

The city of Missoula has been designated as nonattainment for total suspended particulates. The city has incorporated a systematic program of street sweeping and flushing to show attaiment by 1982. The plan was approved by EPA in September 23, 1980 (45 FR 62984). EPA approved a minor revision to the plan (removing two street paving projects) on January 16, 1986. Data to date indicates compliance with the annual standard, but an occasional excursion of the 24-hour standard.

11. Missoula - CO

Missoula was designated as nonattainment for carbon monoxide based upon a monitoring station near the intersection of Brooks, Russell, and South (Malfunction Junction). A plan was developed wich called for the reconstruction of the intersection. This reconstruction is nearly complete. The plan was proposed for approval on July 23, 1984 (49 FR 29620) and received final approval on January 16, 1986, (51 FR 2397). EPA's approval notes that the potential exists that areawide sources such as wood stove emissions may be contributing to the problem and this needs to be watched closely in the future.

### 12. Laurel/Billings - $SO_2$

The Laurel area was designated as nonattainment for sulfur dioxide due to readings near the Cenex refinery. Modeling calculations showed potential violations within the Billings area as well. In 1977, a stipulation was signed between the various sulfur dioxide sources and the Department of Health and Environmental Sciences to further study the matter. The stipulation also required some modifications at these sources. An ambient sampling program, as required by the stipulation, was completed in October, 1982. The results of the ambient air quality monitoring indicate compliance with the national standards except for one 3-hour episode in January, 1985. The department has investigated this matter and traced the problem to a malfunction at the Conoco refinery.

The department is undecided at this date whether to request redesignation. The department is proceeding with the development of performance standards for the industries as a result of a board directive.

### 13. Anaconda - $SO_2$

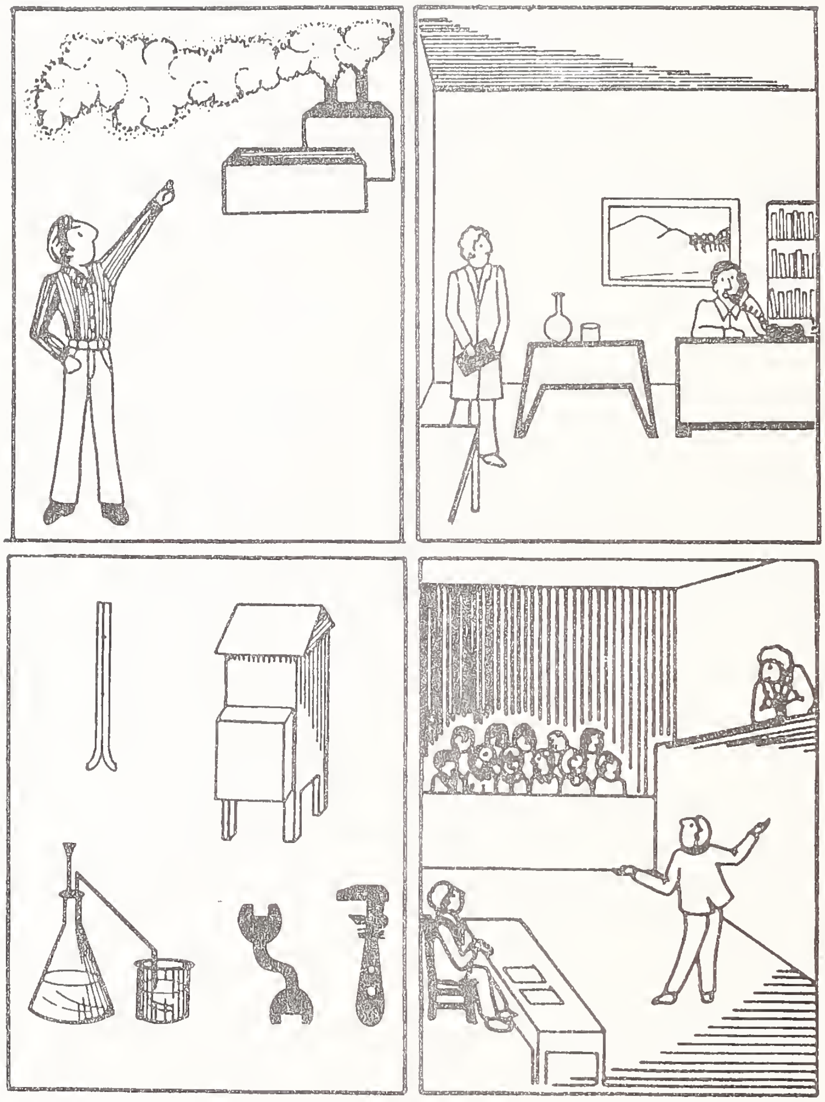
The Anaconda area was designated nonattainment for sulfur dioxide. The area experienced frequent violations of the ambient air quality standards for sulfur dioxide as a results of the Anaconda Company (ARCO) copper smelter complex. In July, 1980, the smelter temporarily ceased operations as a results of a strike. In September of the same year, Anaconda announced it was permanently ceasing operations at the smelter. As a result of these conditions, the state requested the area be redesignated to attainment. The designation to attainment was made final on July 15, 1982 (47 FR 30762).

## Impacts of Designation

Designation of an area as nonattainment triggers the requirement to develop a control plan to bring the area into compliance. The final compliance date for primary sulfur dioxide and total suspended particulate standards was December 31, 1982. For carbon monoxide and oxidants, the act provided for extensions up to December 31, 1987.

The Department developed control plans for each of the nonattainment areas and they are contained in the State Implementation Plan. Many of the plans were modified as more accurate air quality and emissions data became available. Some of the plans such as the East Helena sulfur dioxide plan were carried out with good success. Others were unnecessary due to plant shutdowns as was the case in Anaconda. The plans for carbon monoxide have been followed and are showing progress toward compliance. Although plans were developed for particulates, progress has been slow due to expensive and untried control strategies and the need for frequent plan modifications. Nevertheless it appears that compliance with the primary total suspended particulate standard has been achieved in Colstrip, Butte, and Columbia Falls.

The Department is continuing to work on the particulate problem; however, the newly proposed $PM_{10}$ standard may change the attainment/nonattainment status of some areas as well as the appropriate control strategies. Since the $PM_{10}$ standard considers only particles less than 10 microns in diameter vs. 40 microns for total suspended particulate, control strategies will need to be directed at sources of fine particulate.



# APPENDIX D

## Precision & Accuracy

# APPENDIX D

## Precision/Accuracy

Precision applies to the repeatability of the instrument and is obtained by the use of collocated samplers (TSP) or the introduction of a known low ppm gas concentration on a weekly or oftener basis. Ninety-five percent confidence levels (probability limits) are then calculated from the average % difference and the standard deviation % difference. $PL = \bar{X} \pm 1.96\ SD/\overline{2}$ (TSP) or $PL = \bar{X} \pm 1.96\ SD$ (continuous).

Accuracy implies just that. How accurate is the instrument? It is established through independent audits by the Quality Assurance Section of AQB. Probability limits are calculated as with precision data. $PL = \bar{X} \pm 1.96\ SD/\overline{2}$ (TSP); $PL = \bar{X} \pm 1.96\ SD$.

The EPA requires quarterly reports of the P&A data, as well as an annual SLAMS (State and Local Air Monitoring Sites) report which includes the P&A for SLAMS sites throughout the state.

Tables DI (Precision) and DII (Accuracy) summarize the P&A data by reporting agency and pollutant, quarterly and annually. Table DIII lists the audits performed in 1984 by site, giving dates and % difference.

Table DI

Precision TSP

Air Quality Bureau #001

| | | Quarter | | | |
|---|---|---|---|---|---|
| | 1st | 2nd | 3rd | 4th | Annual |
| Avg. % Diff. | - 2.03 | - 4.20 | - 5.15 | -12.05 | - 2.77 |
| Std. Deviation (SD) % Diff. | 6.13 | 7.89 | 9.12 | 6.36 | 7.90 |
| Upper Prob. Limit (UPL) | + 6.19 | + 6.74 | + 2.49 | +10.86 | + 8.18 |
| Lower Prob. Limit (LPL) | -10.79 | -15.14 | -17.78 | - 6.75 | -13.73 |
| No. of Data Pairs | 55 | 57 | 52 | 37 | 201 |
| No. Readings 20 ug | 0 | 0 | 5 | 2 | 7 |
| No. of Sites | 3 | 3 | 3 | 2 | 3 |

Yellowstone County #002

| | | Quarter | | | |
|---|---|---|---|---|---|
| | 1st | 2nd | 3rd | 4th | Annual |
| Avg. % Diff. | + 2.02 | + 5.56 | + 3.59 | + 1.29 | + 3.16 |
| SD % Diff. | 4.96 | 3.39 | 4.09 | 5.86 | 4.81 |
| UPL | + 8.89 | +10.26 | + 9.26 | + 9.41 | + 9.83 |
| LPL | - 4.85 | + 0.86 | - 2.07 | - 6.84 | - 3.50 |
| No. of Data Pairs | 14 | 15 | 15 | 14 | 58 |
| No. Readings 20 ug | 0 | 0 | 2 | 0 | 2 |
| No. of Sites | 1 | 1 | 1 | 1 | 1 |

Cascade County #003

| | | Quarter | | | |
|---|---|---|---|---|---|
| | 1st | 2nd | 3rd | 4th | Annual |
| Avg. % Diff. | - 9.16 | + 1.70 | - 2.51 | - 2.62 | - 3.17 |
| SD % Diff | 7.80 | 6.67 | 7.75 | 7.97 | 8.36 |
| UPL | + 1.66 | +10.94 | + 8.23 | + 8.40 | + 8.42 |
| LPL | -19.97 | - 7.54 | -13.25 | -13.67 | -14.76 |
| No. of Data Pairs | 15 | 15 | 14 | 14 | 58 |
| No. Readings 20 ug | 4 | 2 | 4 | 0 | 10 |
| No. of Sites | 1 | 1 | 1 | 1 | 1 |

Table DI, Cont.

Missoula County #004

| | Quarter | | | | |
|---|---|---|---|---|---|
| | 1st | 2nd | 3rd | 4th | Annual |
| Avg. % Diff. | + 2.78 | - 0.43 | + 3.42 | - 2.46 | + 0.89 |
| SD % Diff. | 7.83 | 8.47 | 5.55 | 6.98 | 7.65 |
| UPL | +13.63 | +11.31 | +11.11 | + 7.20 | +11.50 |
| LPL | - 8.07 | -12.18 | - 4.26 | -12.13 | - 9.71 |
| No. of Data Pairs | 23 | 33 | 24 | 18 | 98 |
| No. Readings @20 ug | 0 | 0 | 4 | 2 | 6 |
| No. of Sites | 1 | 1 | 1 | 1 | 1 |

## Precision SO2

Air Quality Bureau #001 (SLAMS/NAMS)

| | Quarter | | | | |
|---|---|---|---|---|---|
| | 1st | 2nd | 3rd | 4th | Annual |
| Avg. % Diff. | - 6.54 | - 5.29 | - 1.49 | - 0.60 | - 3.77 |
| SD % Diff. | 6.10 | 6.25 | 4.89 | 6.72 | 6.56 |
| UPL | + 5.42 | + 6.97 | + 8.10 | +12.58 | + 9.08 |
| LPL | -18.49 | -17.55 | -11.08 | -13.77 | -16.62 |
| No. Checks | 41 | 57 | 29 | 42 | 169 |
| No. of Sites | 3 | 3 | 3 | 3 | 3 |

Air Quality Bureau #001 (All Sites)

| | Quarter | | | | |
|---|---|---|---|---|---|
| | 1st | 2nd | 3rd | 4th | Annual |
| Avg. % Diff. | - 4.94 | - 4.61 | - 1.49 | - 0.60 | - 4.22 |
| SD % Diff. | 5.64 | 5.82 | 4.89 | 6.72 | 6.20 |
| UPL | + 6.11 | + 6.80 | + 8.10 | +12.58 | + 7.93 |
| LPL | -15.99 | -16.03 | -11.08 | -13.77 | -16.37 |
| No. Checks | 63 | 79 | 29 | 42 | 311 |
| No. of Sites | 5 | 5 | 5 | 5 | 5 |

## Precision CO

Yellowstone County #002

| | Quarter | | | | |
|---|---|---|---|---|---|
| | 1st | 2nd | 3rd | 4th | Annual |
| Avg. % Diff. | - 2.33 | - 2.89 | + 0.34 | + 0.55 | + 0.25 |
| SD % Diff. | 6.35 | 4.88 | 1.52 | 1.20 | 2.56 |
| UPL | +10.12 | + 6.68 | + 2.64 | + 1.81 | + 5.28 |
| LPL | -14.78 | -12.47 | - 3.33 | - 2.91 | - 4.77 |
| No. Checks | 14 | 16 | 13 | 12 | 49 |
| No. of Sites | 1 | 1 | 1 | 1 | 1 |

Table DI, Cont.

Cascade County #003

| | Quarter | | | | |
|---|---|---|---|---|---|
| | 1st | 2nd | 3rd | 4th | Annual |
| Avg. % Diff. | - 2.32 | - 0.37 | + 0.34 | + 0.55 | + 0.25 |
| SD % Diff. | 2.96 | 3.12 | 1.52 | 1.20 | 2.56 |
| UPL | + 8.12 | + 5.75 | + 2.64 | + 1.81 | + 5.28 |
| LPL | - 3.42 | - 6.48 | - 3.33 | - 2.91 | - 4.77 |
| No. Checks | 12 | 12 | 13 | 12 | 49 |
| No. of Sites | 1 | 1 | 1 | 1 | 1 |

Missoula County #004

| | Quarter | | | | |
|---|---|---|---|---|---|
| | 1st | 2nd | 3rd | 4th | Annual |
| Avg. % Diff. | + 4.42 | - 1.12 | no data | + 5.56 | + 1.72 |
| SD % Diff. | 4.97 | 5.61 | site down | 0.79 | 5.71 |
| UPL | +14.17 | + 9.87 | | + 7.10 | +12.90 |
| LPL | - 5.32 | -12.12 | | + 4.02 | - 9.47 |
| No. Checks | 9 | 14 | | 4 | 27 |
| No. of Sites | 1 | 1 | 1 | 1 | 1 |

## Precision Lead

Air Quality Bureau #001

| | Quarter | | | | |
|---|---|---|---|---|---|
| | 1st | 2nd | 3rd | 4th | Annual |
| Avg. % Diff. | - 2.91 | - 6.14 | -13.66 | - 1.66 | - 5.95 |
| SD % Diff. | 14.47 | 8.97 | 24.49 | 13.90 | 16.91 |
| UPL | +18.53 | + 6.30 | +20.29 | +17.61 | +17.49 |
| LPL | -24.35 | -18.58 | -47.60 | -20.93 | -29.39 |
| No. of Data Pairs | 28 | 28 | 26 | 28 | 110 |
| No. Readings @0.15 ug | 0 | 0 | 0 | 2 | 2 |
| No. of Sites | 1 | 1 | 1 | 1 | 1 |

Precision PM-10

Air Quality Bureau #001

| | | Quarter | | | | |
|---|---|---|---|---|---|---|
| | | 1st | 2nd | 3rd | 4th | Annual |
| Avg. % Diff. | | | + 1.12 | - 0.18 | + 0.09 | + 0.32 |
| SD % Diff. | | no | 15.25 | 7.98 | 4.68 | 10.16 |
| UPL | | data | +22.26 | +10.88 | + 6.58 | +14.41 |
| LPL | | sites | -20.02 | -11.24 | - 6.40 | -13.76 |
| No. Checks | | not | 18 | 21 | 16 | 55 |
| No. Readings | 0.20 ug | in | 4 | 4 | 4 | 12 |
| No. of Sites | | | 2 | 2 | 2 | 2 |

# TABLE DII

## Accuracy TSP

### Air Quality Bureau #001 (SLAMS/NAMS)

| | Quarter | | | | |
|---|---|---|---|---|---|
| | 1st | 2nd | 3rd | 4th | Annual |
| Avg. % Diff. | - 1.19 | - 1.28 | - 1.91 | - 0.45 | - 1.27 |
| SD % Diff. | 2.05 | 2.13 | 1.34 | 1.59 | 1.84 |
| UPL | + 2.82 | + 2.90 | + 0.72 | + 2.67 | + 2.33 |
| LPL | - 5.20 | - 5.45 | - 4.54 | - 3.57 | - 4.88 |
| No. of Audits | 18 | 16 | 18 | 12 | 64 |

### Air Quality Bureau #001 (All Sites)

| | 1st | 2nd | 3rd | 4th | Annual |
|---|---|---|---|---|---|
| Avg. % Diff. | - 0.58 | - 1.53 | - 1.91 | - 0.45 | - 1.17 |
| SD % Diff. | 2.73 | 2.20 | 1.34 | 1.59 | 2.14 |
| UPL | + 4.99 | + 2.78 | + 0.72 | + 2.67 | + 3.04 |
| LPL | - 6.28 | - 5.85 | - 4.54 | - 3.57 | - 5.37 |
| No. of Audits | 20 | 19 | 18 | 12 | 69 |

### Yellowstone County #002

| | 1st | 2nd | 3rd | 4th | Annual |
|---|---|---|---|---|---|
| Avg. % Diff. | + 2.30 | + 0.25 | - 2.70 | - 0.15 | - 0.37 |
| SD % Diff. | 8.06 | 1.48 | 6.38 | 0.78 | 4.75 |
| UPL | +18.10 | + 3.16 | + 9.80 | + 1.37 | + 8.95 |
| LPL | -13.50 | - 2.66 | -15.20 | - 1.67 | - 9.68 |
| No. of Audits | 2 | 2 | 3 | 2 | 9 |

### Cascade County #003

| | 1st | 2nd | 3rd | 4th | Annual |
|---|---|---|---|---|---|
| Avg. % Diff. | + 0.37 | + 0.67 | + 1.05 | + 1.65 | + 0.88 |
| SD % Diff. | 1.76 | 2.30 | 2.93 | 3.89 | 2.33 |
| UPL | + 3.82 | + 5.18 | + 6.79 | + 9.27 | + 5.46 |
| LPL | - 3.09 | - 3.84 | - 4.69 | - 5.97 | - 3.69 |
| No. of Audits | 3 | 3 | 4 | 2 | 12 |

### Missoula County #004

| | 1st | 2nd | 3rd | 4th | Annual |
|---|---|---|---|---|---|
| Avg. % Diff. | + 0.60 | - 0.14 | - 2.86 | - 6.23 | - 1.40 |
| SD % Diff. | 2.75 | 2.67 | 2.25 | 3.85 | 3.45 |
| UPL | + 5.99 | + 5.09 | + 1.56 | + 1.31 | + 5.36 |
| LPL | - 4.79 | - 5.37 | - 7.28 | -13.78 | - 8.15 |
| No. of Audits | 10 | 5 | 8 | 3 | 26 |

### Accuracy AQB PM-10

| | 1st | 2nd | 3rd | 4th | Annual |
|---|---|---|---|---|---|
| Avg. % Diff. | + 0.60 | - 0.14 | - 2.86 | - 6.23 | - 1.40 |
| SD % Diff. | 2.75 | 2.67 | 2.25 | 3.85 | 3.45 |
| UPL | + 5.99 | + 5.09 | + 1.56 | + 1.31 | + 5.36 |
| LPL | - 4.79 | - 5.37 | - 7.28 | -13.78 | - 8.15 |
| No. of Audits | 10 | 5 | 8 | 3 | 26 |

## TABLE DII, Cont.

Industry*

| | Quarter | | | | |
|---|---|---|---|---|---|
| | 1st | 2nd | 3rd | 4th | Annual |
| Avg. % Diff. | - 2.44 | + 0.31 | - 2.78 | + 1.94 | - 0.77 |
| SD % Diff. | 5.52 | 2.50 | 3.60 | 4.21 | 4.53 |
| UPL | + 8.38 | + 5.21 | + 4.28 | +10.18 | + 8.12 |
| LPL | -13.26 | - 4.58 | - 9.83 | - 6.31 | - 9.66 |
| No. of Audits | 10 | 7 | 13 | 13 | 43 |

Indian Reservations*

| | 1st | 2nd | 3rd | 4th | Annual |
|---|---|---|---|---|---|
| Avg. % Diff. | - 1.05 | --- | - 8.60 | --- | - 2.56 |
| SD % Diff. | 2.07 | --- | --- | --- | 3.82 |
| UPL | + 3.01 | --- | --- | --- | + 4.94 |
| LPL | - 5.11 | --- | --- | --- | -10.06 |
| No. of Audits | 4 | --- | 1 | --- | 5 |

*Data by site available by request.

Accuracy AQB PM-10

| | 1st | 2nd | 3rd | 4th | Annual |
|---|---|---|---|---|---|
| Avg. % Diff. | no | - 4.52 | - 4.18 | - 6.83 | - 4.78 |
| SD % Diff. | data | 1.68 | 4.17 | 4.74 | 3.43 |
| UPL | sites | - 1.23 | + 3.99 | + 2.46 | + 1.95 |
| LPL | not | - 7.81 | -12.35 | -16.11 | -11.50 |
| No. of Audits | in | 22 | 18 | 8 | 48 |

Accuracy Missoula PM-10/15

| | 1st | 2nd | 3rd | 4th | Annual |
|---|---|---|---|---|---|
| Avg. % Diff. | + 0.57 | -13.80 | -15.80 | - 0.84 | - 3.21 |
| SD % Diff. | 4.84 | | | 20.73 | 15.30 |
| UPL | +10.06 | | | +39.79 | +26.78 |
| LPL | - 8.92 | | | -41.47 | -33.20 |
| No. of Audits | 3 | 1 | 1 | 5 | 10 |

### Accuracy SO2

Air Quality Bureau #001 (SLAMS/NAMS)

| | | Level 1 | Level 2 | Level 3 | Level 4 | Full Scale |
|---|---|---|---|---|---|---|
| 1st Qtr. | Avg. % Diff. | - 5.03 | - 5.80 | - 6.83 | - 7.73 | - 7.47 |
| | SD % Diff. | 21.65 | 10.67 | 7.20 | 6.17 | 5.87 |
| | UPL | +37.40 | +15.11 | + 7.27 | + 4.36 | + 4.04 |
| | LPL | -47.46 | -26.71 | -20.94 | -19.83 | -18.98 |
| | No. of Audits | 3 | 3 | 3 | 3 | 3 |

Table DII, Cont.

| | | Level 1 | Level 2 | Level 3 | Level 4 | Full Scale |
|---|---|---|---|---|---|---|
| 2nd Qtr. | Avg. % Diff. | -11.67 | -10.30 | -11.53 | -11.77 | -11.80 |
| | SD % Diff. | 2.51 | 2.69 | 2.18 | 2.15 | 2.15 |
| | UPL | - 6.74 | - 5.03 | - 7.26 | - 7.55 | - 7.58 |
| | LPL | -16.60 | -15.57 | -15.80 | -15.98 | -16.02 |
| | No. of Audits | 3 | 3 | 3 | 3 | 3 |
| 3rd Qtr. | Avg. % Diff. | -12.67 | - 9.67 | - 9.90 | -11.00 | -10.63 |
| | SD % Diff. | 10.64 | 4.00 | 2.71 | 2.42 | 2.42 |
| | UPL | + 8.18 | - 1.53 | - 4.59 | - 6.25 | - 5.89 |
| | LPL | -33.51 | -17.71 | -15.21 | -15.75 | -15.38 |
| | No. of Audits | 3 | 3 | 3 | 3 | 3 |
| 4th Qtr. | Avg. % Diff. | + 4.30 | + 4.80 | + 3.80 | + 2.30 | + 2.27 |
| | SD % Diff. | 6.61 | 2.96 | 2.49 | 2.52 | 3.01 |
| | UPL | +17.25 | +10.60 | + 8.68 | + 2.25 | + 8.16 |
| | LPL | - 8.65 | - 1.00 | - 1.08 | - 2.65 | - 3.63 |
| | No. of Audits | 3 | 3 | 3 | 3 | 3 |
| Annual | Avg. % Diff. | - 6.27 | - 5.24 | - 6.12 | - 7.05 | - 6.91 |
| | SD % Diff. | 12.84 | 8.16 | 7.18 | 6.65 | 6.57 |
| | UPL | +18.90 | +10.75 | + 7.96 | + 5.99 | + 5.97 |
| | LPL | -31.43 | -21.23 | -20.20 | -20.09 | -19.79 |
| | No. of Audits | 12 | 12 | 12 | 12 | 12 |

Air Quality Bureau #001 (All Sites)

| | | Level 1 | Level 2 | Level 3 | Level 4 | Full Scale |
|---|---|---|---|---|---|---|
| 1st Qtr. | Avg. % Diff. | - 3.28 | - 4.18 | - 6.45 | - 7.73 | - 6.88 |
| | SD % Diff. | 18.02 | 9.30 | 5.93 | 6.17 | 4.94 |
| | UPL | +32.05 | +14.05 | + 5.17 | + 4.36 | + 2.81 |
| | LPL | -38.60 | -22.40 | -18.07 | -19.83 | -16.56 |
| | No. of Audits | 4 | 4 | 4 | 3 | 4 |
| 2nd Qtr. | Avg. % Diff. | - 8.08 | - 8.26 | - 9.92 | -11.77 | - 9.94 |
| | SD % Diff. | 5.77 | 3.39 | 2.75 | 2.15 | 3.03 |
| | UPL | + 3.23 | - 1.61 | - 4.53 | - 7.55 | - 4.01 |
| | LPL | -19.39 | -14.91 | -15.31 | -15.98 | -15.87 |
| | No. of Audits | 5 | 5 | 5 | 3 | 5 |
| 3rd Qtr. | Avg. % Diff. | -12.67 | - 9.67 | - 9.90 | -11.00 | -10.63 |
| | SD % Diff. | 10.64 | 4.00 | 2.71 | 2.42 | 2.42 |
| | UPL | + 8.18 | - 1.53 | - 4.59 | - 6.25 | - 5.89 |
| | LPL | -33.51 | -17.71 | -15.21 | -15.75 | -15.38 |
| | No. of Audits | 3 | 3 | 3 | 3 | 3 |
| 4th Qtr. | Avg. % Diff. | + 4.30 | + 4.80 | + 3.80 | + 2.30 | + 2.27 |
| | SD % Diff. | 6.61 | 2.96 | 2.49 | 2.52 | 3.01 |
| | UPL | +17.25 | +10.60 | + 8.68 | + 2.25 | + 8.16 |
| | LPL | - 8.65 | - 1.00 | - 1.08 | - 2.65 | - 3.63 |
| | No. of Audits | 3 | 3 | 3 | 3 | 3 |

Table DII, Cont.

| | | Level 1 | Level 2 | Level 3 | Level 4 | Full Scale |
|---|---|---|---|---|---|---|
| Annual | Avg. % Diff. | - 5.24 | - 4.84 | - 6.25 | - 7.05 | - 6.82 |
| | SD % Diff. | 11.70 | 7.39 | 4.35 | 6.55 | 5.85 |
| | UPL | +17.69 | + 9.65 | + 2.27 | + 5.99 | + 4.65 |
| | LPL | -28.17 | -19.33 | -14.77 | -20.09 | -18.25 |
| | No. of Audits | 15 | 15 | 15 | 12 | 15 |

Accuracy CO

Yellowstone County #002

| | | Level 1 | Level 2 | Level 3 | Level 4 | Full Scale |
|---|---|---|---|---|---|---|
| 1st Qtr. | Avg. % Diff. | -17.80 | - 9.30 | - 9.00 | --- | - 8.50 |
| | SD % Diff. | --- | --- | --- | --- | --- |
| | UPL | --- | --- | --- | --- | --- |
| | LPL | --- | --- | --- | --- | --- |
| | No. of Audits | 1 | 1 | 1 | 0 | 1 |
| 2nd Qtr. | Avg. % Diff. | -10.85 | - 6.60 | - 5.20 | --- | - 5.05 |
| | SD % Diff. | 9.83 | 3.82 | 5.37 | --- | 4.88 |
| | UPL | + 8.41 | + 0.88 | + 5.33 | --- | + 4.51 |
| | LPL | -30.11 | -14.08 | -15.73 | --- | -14.61 |
| | No. of Audits | 1 | 1 | 1 | 0 | 1 |
| 3rd Qtr. | Avg. % Diff. | + 5.00 | + 2.90 | + 0.60 | --- | + 0.60 |
| | SD % Diff. | --- | --- | --- | --- | --- |
| | UPL | --- | --- | --- | --- | --- |
| | LPL | --- | --- | --- | --- | --- |
| | No. of Audits | 1 | 1 | 1 | 0 | 1 |
| 4th Qtr. | Avg. % Diff. | + 5.95 | + 1.30 | - 3.05 | --- | - 2.60 |
| | SD % Diff. | 1.48 | 2.69 | 0.64 | --- | 0.28 |
| | UPL | + 8.86 | + 6.57 | - 1.80 | --- | - 2.05 |
| | LPL | + 3.04 | - 3.97 | - 4.30 | --- | - 3.15 |
| | No. of Audits | 2 | 2 | 2 | 0 | 2 |
| Annual | Avg. % Diff. | - 0.96 | - 1.54 | - 3.18 | --- | - 2.94 |
| | SD % Diff. | 10.31 | 5.22 | 3.60 | --- | 3.37 |
| | UPL | +19.25 | + 8.68 | + 3.87 | --- | + 3.67 |
| | LPL | -21.17 | -11.76 | -10.23 | --- | - 9.55 |
| | No. of Audits | 5 | 5 | 5 | 0 | 5 |

## Table DII, Cont.

### Cascade County #003

| | | Level 1 | Level 2 | Level 3 | Level 4 | Full Scale |
|---|---|---|---|---|---|---|
| 1st Qtr. | Avg. % Diff. | + 0.85 | + 2.50 | + 2.85 | --- | + 2.75 |
| | SD % Diff. | 11.95 | 5.23 | 0.92 | --- | 1.34 |
| | UPL | +24.27 | +12.76 | + 4.65 | --- | + 5.38 |
| | LPL | -22.57 | - 7.76 | + 1.05 | --- | + 0.12 |
| | No. of Audits | 2 | 2 | 2 | 0 | 2 |
| 2nd Qtr. | Avg. % Diff. | -13.70 | -13.80 | - 7.60 | --- | - 8.20 |
| | SD % Diff. | --- | --- | --- | --- | --- |
| | UPL | --- | --- | --- | --- | --- |
| | LPL | --- | --- | --- | --- | --- |
| | No. of Audits | 1 | 1 | 1 | 0 | 1 |
| 3rd Qtr. | Avg. % Diff. | +10.20 | + 5.25 | + 4.65 | --- | + 4.20 |
| | SD % Diff. | 3.39 | 1.63 | 0.21 | --- | 0.28 |
| | UPL | +16.85 | + 8.44 | + 5.07 | --- | + 4.75 |
| | LPL | + 3.55 | + 2.06 | + 4.23 | --- | + 3.65 |
| | No. of Audits | 2 | 2 | 2 | 0 | 2 |
| 4th Qtr. | Avg. % Diff. | + 2.05 | + 1.40 | + 0.40 | --- | - 0.55 |
| | SD % Diff. | 1.91 | 0.28 | 0.71 | --- | 0.07 |
| | UPL | + 5.79 | + 1.95 | + 1.79 | --- | - 0.41 |
| | LPL | - 1.69 | + 0.85 | - 0.99 | --- | - 0.69 |
| | No. of Audits | 2 | 2 | 2 | 0 | 2 |
| Annual | Avg. % Diff. | + 1.58 | + 1.06 | + 1.54 | --- | + 1.12 |
| | SD % Diff. | 9.26 | 6.34 | 3.78 | --- | 3.96 |
| | UPL | +19.72 | +13.49 | + 8.96 | --- | + 8.89 |
| | LPL | -16.56 | -11.38 | - 5.87 | --- | - 6.65 |
| | No. of Audits | 7 | 7 | 7 | 0 | 7 |

### Missoula County #004

| | | Level 1 | Level 2 | Level 3 | Level 4 | Full Scale |
|---|---|---|---|---|---|---|
| 1st Qtr. | Avg. % Diff. | + 6.90 | + 5.50 | + 1.10 | --- | + 3.70 |
| | SD % Diff. | --- | --- | --- | --- | --- |
| | UPL | --- | --- | --- | --- | --- |
| | LPL | --- | --- | --- | --- | --- |
| | No. of Audits | 1 | 1 | 1 | 0 | 1 |
| 2nd Qtr. | Avg. % Diff. | + 0.70 | + 2.60 | + 1.60 | --- | + 3.05 |
| | SD % Diff. | 8.77 | 4.10 | 0.71 | --- | 0.92 |
| | UPL | +17.89 | +10.64 | + 2.99 | --- | + 4.85 |
| | LPL | -16.49 | - 5.44 | + 0.21 | --- | + 1.25 |
| | No. of Audits | 1 | 1 | 1 | 0 | 1 |

Table DII, Cont.

| | | Level 1 | Level 2 | Level 3 | Level 4 | Full Scale |
|---|---|---|---|---|---|---|
| 3rd Qtr. | Avg. % Diff. | --- | --- | --- | --- | --- |
| | SD % Diff. | --- | --- | --- | --- | --- |
| | UPL | site shut down for summer | | | | |
| | LPL | --- | --- | --- | --- | --- |
| | No. of Audits | 0 | 0 | 0 | 0 | 0 |
| 4th Qtr. | Avg. % Diff. | - 8.70 | - 5.90 | + 4.65 | --- | + 3.80 |
| | SD % Diff. | 4.81 | 2.69 | 2.90 | --- | 2.97 |
| | UPL | + 0.72 | - 0.63 | +10.33 | --- | + 9.62 |
| | LPL | -18.12 | -11.17 | -10.32 | --- | - 2.02 |
| | No. of Audits | 2 | 2 | 2 | 0 | 2 |
| Annual | Avg. % Diff. | - 4.00 | - 1.65 | + 3.13 | --- | + 3.43 |
| | SD % Diff. | 7.92 | 5.67 | 2.46 | --- | 1.85 |
| | UPL | +11.53 | + 9.45 | + 7.95 | --- | + 7.04 |
| | LPL | -19.53 | -12.75 | - 1.70 | --- | - 0.19 |
| | No. of Audits | 4 | 4 | 4 | 0 | 4 |

Accuracy Lead

Air Quality Bureau #001 (SLAMS/NAMS)

| | Quarter | | | | |
|---|---|---|---|---|---|
| | 1st | 2nd | 3rd | 4th | Annual |
| Avg. % Diff. | - 2.06 | - 1.27 | - 2.30 | - 0.08 | - 0.99 |
| SD % Diff. | 1.50 | 2.82 | --- | 1.25 | 1.99 |
| UPL | + 1.88 | + 4.26 | --- | + 2.38 | + 2.92 |
| LPL | - 3.99 | - 6.80 | --- | - 2.53 | - 4.90 |
| No. of Audits | 7 | 7 | 1 | 4 | 19 |

Table DIII

## TSP Site/Audit List

| Site Name | SAROAD # | Date | % Diff |
|---|---|---|---|
| Anaconda - Lincoln School | 0020 007 F01 | 6-11-85 | -0.3 % |
| | | 12-27-85 | -2.8 % |
| Anaconda - Highway Junction | 0400 004 F02 | 6-11-85 | -1.3 % |
| Billings - City Hall Rptg | 0080 008 G01 | 5-14-85 | +1.3 % |
| | | 12-12-85 | +0.4 % |
| Billings - City Hall Collo | 0080 008 G07 | 5-14-85 | -0.8 % |
| | | 12-12-85 | -0.7 % |
| Billings - Sandstone School | 0080 067 G01 | 1-28-85 | +7.4 % |
| Billings - Grand Avenue | 0080 009 G01 | 1-28-85 | -2.6 % |
| | | 8-19-85 | -4.6 % |
| Billings - Taft School East | 0080 062 F07 | 1-28-85 | -0.8 % |
| | | 5-13-85 | -2.9 % |
| | | 8-20-85 | +1.6 % |
| Billings - Lockwood Park | 0080 065 F01 | 5-13-85 | +0.9 % |
| | | 8-19-85 | -1.8 % |
| | | 12-10-85 | +1.2 % |
| Billings - Taft School West | 0080 062 F01 | 1-28-85 | -7.9 % |
| | | 8-20-85 | -1.6 % |
| Bozeman - City Building TSP | 0120 002 F01 | 1-17-85 | -1.9 % |
| | | 8-10-85 | -1.8 % |
| | | 11-30-85 | -2.1 % |
| Bozeman - City Building PM-10 | 0120 002 F01 | 8-10-85 | -13.3 % |
| | | 12-12-85 | -13.9 % |
| Bozeman - Christie Fields | 0120 007 F01 | 8-10-85 | -1.1 % |
| Bozeman - Whittier School | 0120 005 F01 | 1-17-85 | -2.2 % |
| Butte - Greeley School | 0160 005 F01 | 5-21-85 | -1.3 % |
| Butte - Greeley School PM-10 | 0160 005 F01 | 5-21-85 | -4.2 % |
| | | 12-27-85 | -6.1 % |
| Anaconda - Highway Jct Episode | 0400 004 F05 | 6-11-85 | -0.9 % |
| | | 12-27-85 | +0.4 % |
| Mill Creek - Episode | 0400 012 F05 | 6-11-85 | -5.7 % |
| Choteau - Circle 8 Ranch | 1560 004 N05 | 4-30-85 | -2.1 % |

## Table DIII, Cont.

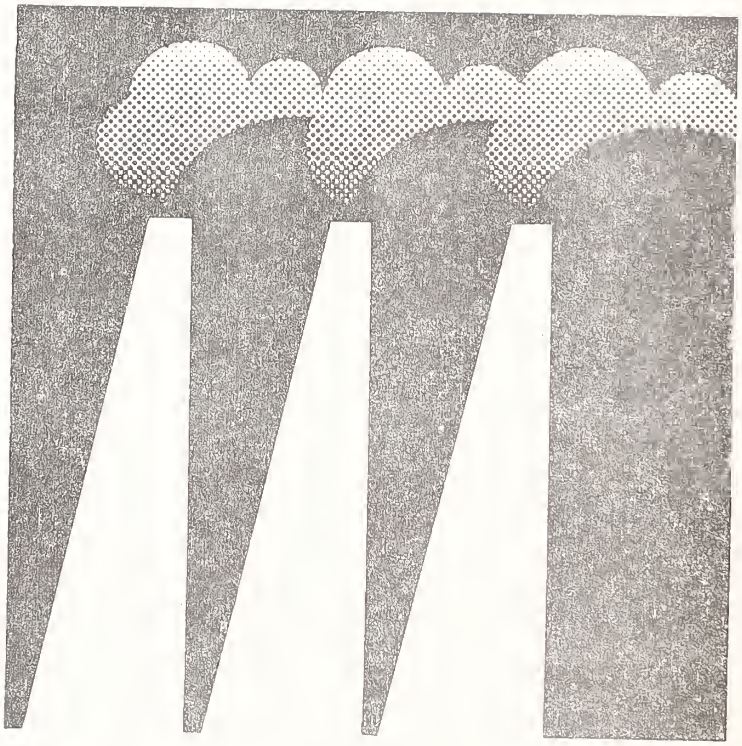
| Site Name | SAROAD # | Date | % Diff |
|---|---|---|---|
| Deer Lodge - Powell Co Courthouse | 0380 001 F01 | 1-10-85 | +6.2 % |
| | | 6-11-85 | +0.9 % |
| | | 12-27-85 | -0.8 % |
| Dillon - Beaverhead Co Cths | 0420 001 F01 | 6-11-85 | +1.2 % |
| East Helena - Hastie | 0860 002 F02 | 2-26-85 | +1.2 % |
| | | 12-26-85 | +1.8 % |
| East Helena - Firehall | 0860 714 F02 | 3-13-85 | -0.1 % |
| | | 6-13-85 | -3.3 % |
| | | 12-26-85 | -0.7 % |
| East Helena - Hadfield West | 0860 719 F02 | 3-13-85 | -2.7 % |
| | | 6-13-85 | -2.3 % |
| | | 12-26-85 | -0.7 % |
| East Helena - Hadfield East | 0860 719 F07 | 6-13-85 | +4.9 % |
| | | 12-26-85 | -0.6 % |
| East Helena - South | 0860 716 F02 | 2-26-85 | -2.7 % |
| East Helena - Dartman Field | 0860 724 F02 | 3-13-85 | -2.2 % |
| | | 6-13-85 | -1.2 % |
| | | 9-16-85 | -2.3 % |
| | | 12-26-85 | -0.8 % |
| Glendive - GMAC | 0600 002 F01 | 1-29-85 | +3.6 % |
| Hamilton - Ravalli Co. Courthouse | 1300 001 F01 | 6-3-85 | -2.8 % |
| Great Falls - Black Eagle Post Office | 0660 019 G01 | 3-5-85 | +0.9 % |
| Great Falls - Library East | 0660 017 G07 | 3-5-85 | -1.6 % |
| | | 4-30-85 | +0.6 % |
| | | 7-9-85 | -1.7 % |
| | | 12-6-85 | +3.6 % |
| Great Falls - Library West | 0660 017 G01 | 3-5-85 | +1.8 % |
| | | 4-30-85 | -1.6 % |
| | | 7-9-85 | +0.2 % |
| | | 12-6-85 | -1.1 % |
| Helena - Cogswell Building TSP | 0720 001 F01 | 3-11-85 | -0.0 % |
| | | 9-18-85 | -2.7 % |
| Helena - Cogswell PM-10 Reporting | 0720 001 F01 | 6-28-85 | -4.3 % |
| Helena - Cogswell PM-10 Collocated | 0720 001 F07 | 6-28-85 | -4.2 % |
| Helena - Cooney Home | 0720 016 G05 | 2-27-85 | -0.4 % |

Table DIII, Cont.

| Site Name | SAROAD # | Date | % Diff |
|---|---|---|---|
| Glacier Nat Park - West Glacier | 0570 007 F02 | 7-23-85 | -1.6 % |
| Kalispell - Universal Athletics (UA) | 0800 015 F01 | 7-24-85 | -3.2 % |
| Libby - Brown | 0900 010 F01 | 7-24-85 | -3.3 % |
| Libby - Courthouse TSP | 0900 012 F01 | 7-24-85 | -1.7 % |
| Libby - Courthouse TSP Collocated | 0900 012 F07 | 7-24-85 | -2.9 % |
| Libby Courthouse PM-10 Reporting | 0900 012 F01 | 7-25-86 | +0.7 % |
| Missoula - Meadow Hills School | 1100 029 G01 | 6-4-85 | -13.4 % |
| Missoula - Boyd Park SW | 1100 024 G01 | 3-19-85 | +2.1 % |
| Missoula - Boyd Park NE | 1100 024 G01 | 3-19-85 | +0.2 % |
| | | 12-16-85 | -6.2 % |
| Missoula - Boyd Park PM-10 E | 1100 024 G01 | 3-19-85 | -1.7 % |
| Missoula - Rose Park R | 1100 020 G01 | 9-24-85 | -2.4 % |
| | | 12-16-85 | -2.4 % |
| Missoula - Rose Park L | 1100 020 G01 | 3-19-85 | -0.6 % |
| | | 9-24-85 | -3.7 % |
| Missoula - Rose Park PM-10 R | 1100 020 G01 | 9-24-85 | -15.8 % |
| | | 12-16-85 | -10.9 % |
| Missoula - Rose Park PM-10 L | 1100 020 G01 | 3-19-85 | -4.6 % |
| | | 12-16-85 | -6.2 % |
| Missoula - Health NE | 1100 031 G01 | 3-19-85 | +0.6 % |
| | | 6-4-85 | -2.9 % |
| | | 9-23-85 | +0.7 % |
| Missoula - Health SW | 1100 031 G01 | 3-19-85 | -0.4 % |
| | | 6-4-85 | +1.4 % |
| | | 9-23-85 | -2.9 % |
| Missoula - Health Collo | 1100 031 G07 | 3-19-85 | -1.6 % |
| | | 6-4-85 | +3.6 % |
| Missoula - Tower/Spurgin/East Missoula | 1100 030 G01 | 6-4-85 | -2.2 % |
| | | 12-17-85 | -10.1 % |
| Missoula - Health PM-15 | 1100 031 G05 | 3-19-85 | -4.6 % |
| Missoula - Stone Container #1 | 1100 015 G02 | 9-24-85 | -0.1 % |
| Ovando - Smith Ranch PM-10 | 1260 024 F03 | 12-17-85 | -3.4 % |

Table DIII, Cont.

| Site Name | SAROAD # | Date | % Diff |
|---|---|---|---|
| Thompson Falls - Sanders Co Courthouse | 1400 003 F01 | 9-23-85 | -2.1 % |
| Thompson Falls - Sanders Co Cths PM-10 | 1400 003 F01 | 9-23-85 | -9.1 % |



# APPENDIX E

## List of Air Quality Publications

# APPENDIX E

## LIST OF AIR QUALITY PUBLICATIONS

State of Montana Air Quality Rules (July, 1984)

Clean Air Act of Montana (November, 1984)

1981 Network Review (November, 1981)

1982 Network Review (April, 1982)

1983 Network Review (September, 1983)

1984 Network Review (December, 1984)

1985 Network Review (August, 1985)

Coefield, J. *et al*. Flathead River Basin Environmental Impact Study - Interim Annual Report for July 1979 through September 1980 (June, 1980).

Coefield, J. *et al*. Flathead River Basin Environmental Impact Study - Interim Annual Report for September 1980 to December 1981 (May, 1983).

Coefield, J.; Raisch, R. Flathead River Basin Environmental Impact Study - Air Resource Final Report (November, 1983).

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Rockwell Int. et al. Final Report for Laurel-Billings $SO_2$ Study, 1982.

## APPENDIX E

## LIST OF MAPS TECHNICAL REPORTS

### Health Effects

1. Johnson, K; Schwaller, R; Wing, B. et al. Pulmonary Function Testing of Patients with Chronic Obstructive Pulmonary Disease (September 1979).

2. Johnson, K.; Gideon, R.; Loftsgaarden, D.; Wing, B. et al. Pulmonary Function Testing of Elementary School Children (October 1979).

3. Johnson, K.; Gideon, R.; Loftsgaarden, D.; Medvec, S.; Simms, M. et al. Relationship Between Human Health and Inhalable Particulates (October 1980).

4. Warren, G.; Rogers, S.; and Medvec, S. Mutagen Screening in an Isolated High Lung Cancer Mortality Area of Montana (June 1979).

### Air Quality

1. Gelhaus, J., Air Quality Data Summaries for Anaconda-Butte, Billings, Missoula, and Columbia Falls/Hardin/East Helena/Colstrip (February 1981).

2. Robbins, H.; Driscoll, P.; Myren, B. et al. Air Monitoring Instrumentation (October 1979).

### Meteorology/Modeling

1. Gelhaus, J. et al. Meteorological Summary - First Year (July 1979).

2. Gelhaus, J. and Harner, S. Deer Lodge Valley Dispersion Study (July 1979).

3. Gelhaus, J. Meteorological Summary - Billings (February 1981).

4. Gelhaus, J., Machler, M., and Stewart, T. Montana Air Resources Modeling System (August 1979).

5. Middlemist, T.; Robbins, H; and Zimmerman, L. Missoula Valley Dispersion Study (September 1980).

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1. Bohn, R.; Cowherd, C.; Keller, R; and Raisch, R. Update and Improvement of the Emission Inventory for MAPS Study Areas (November 1979).

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# APPENDIX F

## Point Source Emission Estimates

# APPENDIX F

## POINT SOURCE EMISSION ESTIMATES - 1985

The following two tables list emission estimates from various industrial sources in the state. Table AP-F-I lists sulfur dioxide emissions; Table AP-F-II lists particulates.

### TABLE AP-F-I

### POINT SOURCE SULFUR DIOXIDE EMISSION ESTIMATES - 1985

| AQCR | Source | $SO_2$ Tons/Yr | County |
|---|---|---|---|
| 140 | East Decker Coal | 41 | Big Horn |
| | Westmoreland Resources | 28 | Big Horn |
| | Spring Creek Coal | 16 | Big Horn |
| | West Decker Coal | 23 | Big Horn |
| | Great Western Sugar | 879 | Yellowstone |
| | Continental Oil Co. (CONOCO) | 3872 | Yellowstone |
| | Farmers' Union CENEX | 8357 | Yellowstone |
| | Exxon Co., USA | 16812 | Yellowstone |
| | Montana Sulfur | 2130 | Yellowstone |
| | Montana Power Co. (Corette) | 6759 | Yellowstone |
| 141 | Montana Refining Co. | 776 | Cascade |
| | Uniteds Materials | 1 | Cascade |
| | Union Oil of California | 136 | Glacier |
| | Gypsy Highview | 76 | Glacier |
| 142 | Stoltze Land & Lumber | 10 | Beaverhead |
| | Pfizer, Inc. | 73 | Beaverhead |
| | Continental Lime | 16 | Broadwater |
| | Pioneer Ready Mix | 3 | Gallatin |
| | A.E. Montana | 3 | Gallatin |
| | Plum Creek/Belgrade | 1 | Gallatin |
| | Ideal Basic Industries | 472 | Gallatin |
| | Kaiser Cement | 374 | Jefferson |
| | Golden Sunlight Mine | 2 | Jefferson |
| | ASARCO, Inc. | 28740 | Lewis & Clark |
| | American Chemet | 4 | Lewis & Clark |
| | Helena Sand & Gravel | 1 | Lewis & Clark |
| | Park Co. Incinerator | 20 | Park |
| 143 | Fisher Sand & Gravel | 2 | Dawson |
| | ANR Stateline Gas Plant | 1186 | Richland |
| | Holly Sugar | 6 | Richland |
| | Montana Dakota Utilities | 3659 | Richland |
| | Koch Hydrocarbon | 274 | Richland |
| | Knife River Coal | 1 | Richland |
| | Montana Power Colstrip 1 & 2 | 6728 | Rosebud |
| | Western Energy Coal | 58 | Rosebud |
| | Montana Power Colstrip 3 & 4 | 1426 | Rosebud |

## TABLE AP-F-I (cont.)

## POINT SOURCE SULFUR DIOXIDE EMISSION ESTIMATES - 1985

| AQCR | Source | $SO_2$ Tons/Yr | County |
|---|---|---|---|
| 144 | American Timber | 1 | Flathead |
| | Plum Creek/Evergreen | 14 | Flathead |
| | Plum Creek/Columbia Falls | 3 | Flathead |
| | Stoltze/Columbia Falls | 3 | Flathead |
| | Columbia Falls Aluminum | 1775 | Flathead |
| | American Asphalt, Inc. | 2 | Flathead |
| | Pack & Company | 1 | Flathead |
| | Flathead County Asphalt | 1 | Flathead |
| | Plum Creek/Pablo | 11 | Lake |
| | Plum Creek/Ksanka | 2 | Lincoln |
| | Champion/Libby | 13 | Lincoln |
| | W. R. Grace | 373 | Lincoln |
| | DAW Forest Products | 1 | Mineral |
| | Champion/Bonner | 9 | Missoula |
| | Louisiana Pacific Particle Board | 3 | Missoula |
| | Champion Intermountain | 1 | Missoula |
| | Pyramid Mountain Lumber | 1 | Missoula |
| | Stone Container, Packaging Div. | 1674 | Missoula |
| | Western Materials | 1 | Missoula |
| | Missoula White Pine | 2 | Missoula |
| | American Asphalt | 2 | Missoula |
| | Darby Lumber | 2 | Ravalli |

Table AP-F-II

POINT SOURCE PARTICULATE EMISSION ESTIMATES - 1985

TSP Emissions

| AQCR | Source | Part. Tons/Yr | County |
|---|---|---|---|
| 140 | East Decker Coal | 838 | Big Horn |
| | Westmoreland Resources | 496 | Big Horn |
| | Spring Creek Coal | 371 | Bighorn |
| | West Decker Coal | 819 | Bighorn |
| | U.S. Gypsum | 17 | Fergus |
| | Century Paving | 3 | Fergus |
| | Spring Creek Forest Products | 53 | Wheatland |
| | Midland Materials | 18 | Yellowstone |
| | Barry O'Leary Co. | 8 | Yellowstone |
| | Cereal Foods Processors | 206 | Yellowstone |
| | Western Sugar | 2369 | Yellowstone |
| | Empire Sand & Gravel | 6 | Yellowstone |
| | Continental Oil Co. (CONOCO) | 320 | Yellowstone |
| | Farmers Union (CENEX) | 805 | Yellowstone |
| | Exxon Co. USA | 1545 | Yellowstone |
| | Montana Power Co. (Corette) | 1342 | Yellowstone |
| 141 | Black Eagle Paving | 9 | Cascade |
| | General Mills | 40 | Cascade |
| | Montana Refining | 7 | Cascade |
| | Big Sky Feed & Supply | 2 | Cascade |
| | Robinson Insulation | 2 | Cascade |
| | Harvest States Coop | 42 | Cascade |
| | Great Falls City Asphalt Plant | 6 | Cascade |
| | United Minerals | 8 | Cascade |
| | Conagra Feed | 9 | Cascade |
| | Cereal Food Processors | 63 | Cascade |
| | Mont. Dept. of Highways Asphalt Plant | 32 | Cascade |
| | GTA Feeds | 70 | Cascade |
| 142 | Stoltze/Dillon | 157 | Beaverhead |
| | Pfizer | 460 | Beaverhead |
| | Townsend Lumber | 191 | Broadwater |
| | Continental Lime | 134 | Broadwater |
| | Rocky Mountain Crushing | 30 | Deer Lodge |
| | Pioneer Ready Mix | 606 | Gallatin |
| | A.E. Montana | 35 | Gallatin |
| | Plum Creek/Belgrade | 53 | Gallatin |
| | Ideal Basic Industries | 154 | Gallatin |
| | Cyprus Ind. Minerals | 23 | Gallatin |
| | Kanta Products | 22 | Gallatin |
| | Kaiser Cement | 1495 | Jefferson |
| | Golden Sunlight Mine | 196 | Jefferson |
| | ASARCO, Inc. | 734 | Lewis & Clark |
| | American Chemet | 21 | Lewis & Clark |
| | Helena Sand & Gravel | 34 | Lewis & Clark |

Table AP-F-II (cont.)

POINT SOURCE PARTICULATE EMISSION ESTIMATES - 1985

TSP Emissions

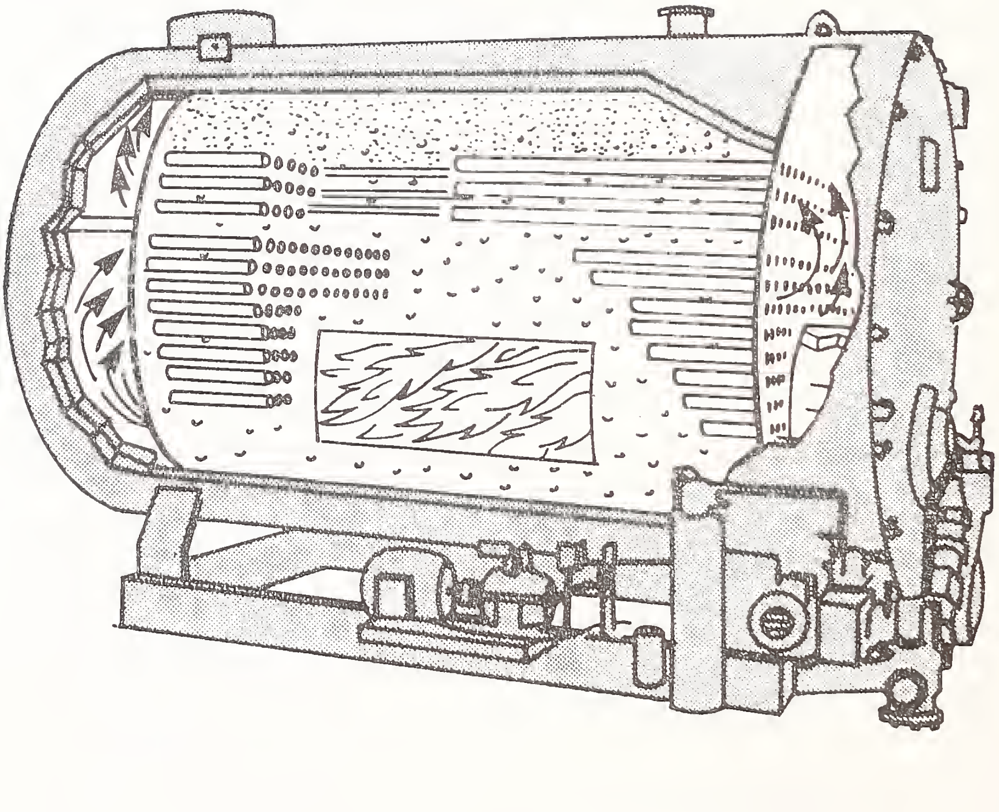
| AQCR | Source | Part. Tons/Yr | County |
|---|---|---|---|
| 142 | Yellowstone Mine | 365 | Madison |
| | Brand S Lumber | 108 | Park |
| | Park County Incinerator | 5 | Park |
| | Park Lumber | 11 | Park |
| | Cominco | 102 | Powell |
| | Louisiana Pacific/Deer Lodge | 194 | Powell |
| | Stauffer | 929 | Silver Bow |
| | Rite Way Asphalt | 2 | Silver Bow |
| | Butte-Silver Bow Asphalt | 1 | Silver Bow |
| | Gilman Excavating | 12 | Silver Bow |
| 143 | Peavey/Miles City | 53 | Custer |
| | Peavey/Glendive | 13 | Dawson |
| | Fisher Sand and Gravel | 187 | Dawson |
| | Holly Sugar | 81 | Richland |
| | Montana-Dakota Utilities | 426 | Richland |
| | Knife River Coal | 108 | Richland |
| | Peabody Coal | 523 | Rosebud |
| | Montana Power/Colstrip 1 & 2 | 1008 | Rosebud |
| | Western Energy | 3148 | Rosebud |
| | Montana Power/Colstrip 3 | 799 | Rosebud |
| 144 | American Timber | 169 | Flathead |
| | Plum Creek/Evergreen | 104 | Flathead |
| | Klinger Lumber | 10 | Flathead |
| | Plum Creek Lumber/Columbia Falls | 254 | Flathead |
| | Stoltze/Columbia Falls | 239 | Flathead |
| | Columbia Falls Aluminum | 31 | Flathead |
| | American Asphalt/Flathead Co. | 55 | Flathead |
| | Pack and Company | 65 | Flathead |
| | Flathead County Asphalt | 35 | Flathead |
| | Kalispell Asphalt Plant | 1 | Flathead |
| | Kal-Mont Lumber | 6 | Flathead |
| | Flathead Lumber | 225 | Lake |
| | Plum Creek/Pablo | 238 | Lake |
| | Owens and Hurst | 15 | Lincoln |
| | Ksanka Lumber | 85 | Lincoln |
| | ASARCO/Troy | 190 | Lincoln |
| | Champion/Libby | 72 | Lincoln |
| | W.R. Grace | 155 | Lincoln |
| | DAW Forest Products | 16 | Mineral |
| | Northwestern Lumber and Cedar | 2 | Mineral |
| | Champion/Bonner | 415 | Missoula |
| | Louisiana Pacific - Particle Board | 476 | Missoula |
| | Champion/Intermountain | 76 | Missoula |
| | Pyramid Mountain Lumber | 63 | Missoula |

Table AP-F-II (cont.)

POINT SOURCE PARTICULATE EMISSION ESTIMATES - 1985

TSP Emissions

| AQCR | Source | Part. Tons/Yr | County |
|---|---|---|---|
| 144 | Stone Container/Frenchtown | 692 | Missoula |
| | Western Materials | 26 | Missoula |
| | Missoula White Pine & Sash | 153 | Missoula |
| | American Asphalt/Missoula Co. | 53 | Missoula |
| | Missoula Asphalt Plant | 1 | Missoula |
| | Missoula County Asphalt Plant | 3 | Missoula |
| | Nicholson Paving | 44 | Missoula |
| | Stoltze/Darby | 110 | Ravalli |
| | Darby Lumber | 26 | Ravalli |
| | Flodin Lumber | 62 | Sanders |
| | W. I. Forest Prod. Inc. | 122 | Sanders |
| | Watters Brother Lumber | 4 | Sanders |



# APPENDIX G

## Prevention of Significant Deterioration

# APPENDIX G

# PREVENTION OF SIGNIFICANT DETERIORATION

Prevention of Significant Deterioration (PSD) requirements were first introduced as part of the 1977 Amendments to the Clean Air Act.

These PSD requirements set limits for increases in ambient pollution levels and established a system for preconstruction review of new major sources. Three PSD classes have been established. Class I allows very small increases in pollution; Class II allows somewhat larger increases; and Class III allows the air quality to "deteriorate" considerably more. In general, Class I is designed for "pristine" areas where almost any deterioration would be significant. Congress established several types of mandatory Class I areas. These mandatory areas include international parks, wilderness areas larger than 5000 acres, national memorial parks larger than 5000 acres, and existing national parks larger than 6000 acres. All other areas of the country classified as attainment are Class II. Class II limits allow for moderate, well-controlled growth and Class III limits allow pollutant levels to increase considerably.

Table AP-G-I shows the allowable increases for the various classes. Table AP-G-II lists the federal Class I areas for Montana and Figure AP-1-G shows the locations of these areas on a map of Montana.

In 1978 the state of Montana established its own PSD rules. These rules were closely patterned after the federal rules. In 1979 the EPA was sued by the Alabama Power Company over the federal PSD rules. The court ruled that EPA had misinterpreted the intent of Congress. As a result the EPA rewrote their rules, which then differed from Montana's rules. The significant difference between the two sets of rules is that the state counted fugitive dust and uncontrolled plant emissions as part of the increment consumption.

Since 1979 the Air Quality Bureau has proceeded with rule-making to adopt an amended PSD rule which resembles the modified EPA rule. Final adoption of the Montana rule occurred January 28, 1983. EPA approved the new rule June 6, 1983, and delegated the entire responsibility for PSD to the state of Montana.

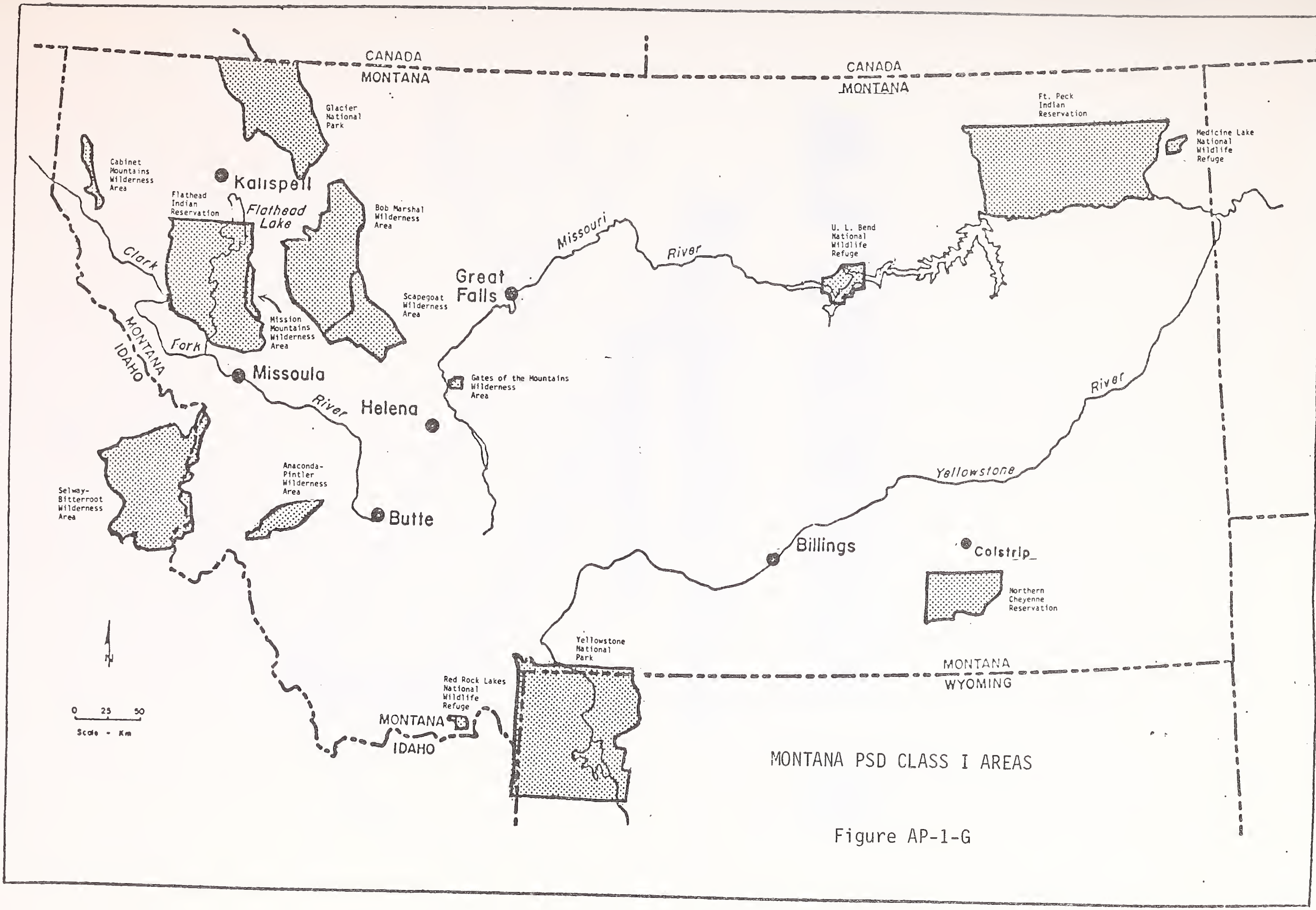
Table AP-G-I
FEDERAL PREVENTION OF SIGNIFICANT DETERIORATION
ALLOWABLE INCREMENTS
Micrograms Per Cubic Meter

| | I | II | III | Not to exceed |
|---|---|---|---|---|
| Particulates | | | | |
| Annual Geo. Mean | 5 | 19 | 37 | 75 |
| Maximum 24-hour | 10 | 37 | 75 | 150 |
| Sulfur Dioxide | | | | |
| Annual Arith. Mean | 2 | 20 | 40 | 80 |
| Maximum 24-hour | 5 | 91 | 182 | 365 |
| Maximum 3-hour | 25 | 512 | 700 | 1300 |

Table AP-G-II

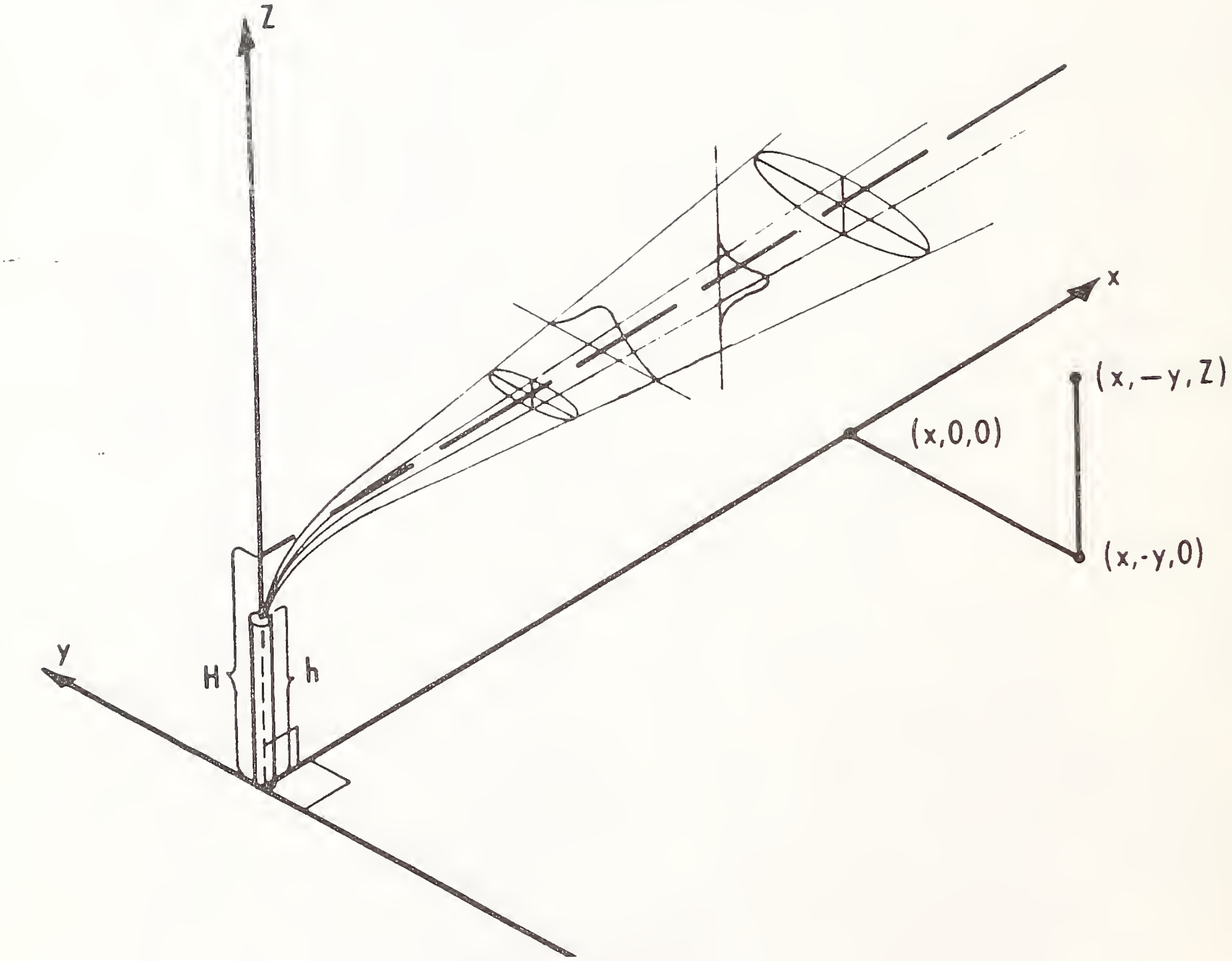
MONTANA FEDERAL CLASS I AREAS

| Area | Location |
|---|---|
| Glacier National Park | NE Kalispell |
| Yellowstone National Park | S Bozeman |
| Bob Marshall Wilderness Area | SE Kalispell |
| Anaconda-Pintlar Wilderness Area | SW Anaconda |
| Selway-Bitterroot Wilderness Area | W Hamilton |
| Cabinet Mountains Wilderness Area | S Libby |
| Scapegoat Wilderness Area | NW Helena |
| Gates of the Mountains Wilderness Area | NE Helena |
| Mission Mountains Wilderness Area | SE Polson |
| Red Rock Lakes National Wildlife Refuge | S Virginia City |
| Medicine Lake National Wildlife Refuge | S Plentywood |
| U. L. Bend National Wildlife Refuge | SW Glasgow |
| Northern Cheyenne Reservation | SE Hardin |
| Flathead Indian Reservation | Near Polson & Ronan |
| Fort Peck Indian Reservation | N Wolf Point |


CANADA
MONTANA
CANADA
MONTANA
Glacier National Park
Cabinet Mountains Wilderness Area
Kalispell
Flathead Indian Reservation
Flathead Lake
Bob Marshal Wilderness Area
Mission Mountains Wilderness Area
Scapegoat Wilderness Area
Clark
Fork
MONTANA
IDAHO
Missoula
River
Helena
Great Falls
Missouri
River
Gates of the Mountains Wilderness Area
U. L. Bend National Wildlife Refuge
Ft. Peck Indian Reservation
Medicine Lake National Wildlife Refuge
Selway-Bitterroot Wilderness Area
Anaconda-Pintler Wilderness Area
Butte
Yellowstone
River
Billings
Colstrip
Northern Cheyenne Reservation
Yellowstone National Park
Red Rock Lakes National Wildlife Refuge
MONTANA
IDAHO
MONTANA
WYOMING
N
0 25 50
Scale - Km

MONTANA PSD CLASS I AREAS

Figure AP-1-G


Z
x
y
H
h
(x,0,0)
(x, −y, Z)
(x,-y,0)

# APPENDIX H

## Air Quality Data Reports

# APPENDIX H

## AIR QUALITY DATA REPORTS

This appendix has been put together to show the data user the varieties of air quality data reports that can be generated by the Department.

The Department uses EPA's Comprehensive Data Handling System (CDHS). This system has two sub-systems: Air Quality Data Handling System (AQDHS) and Emission Inventory System/Point Source (EIS/P&S). The Department recently upgraded its AQDHS system to Version 30.

The following reports have been generated by AQDHS programs.

### AQDHS - Detail List - Daily

| | |
|---|---|
| AP-1-H | Anaconda - Lincoln School TSP - 1985 |
| AP-2-H | Helena - Cogswell Building - TSP - 1984 |
| AP-3-H | Missoula - Rose Park - TSP - 1985 |

### AQDHS - Detail List - Hourly

| | |
|---|---|
| AP-4-H | Billings - Lockwood Park - $SO_2$ - January 1985 |
| AP-5-H | Great Falls - Pardis Clinic - CO - January 1985 |

### AQDHS - Statistical Analysis by Month

| | |
|---|---|
| AP-6-H | Helena - Capital Courts - 1985 |
| AP-7-H | Billings - North Johnson Lane - 1985 |

### AQDHS - Statistical Analysis by Year

| | |
|---|---|
| AP-8-H | East Helena - Firehall - 1985 |
| AP-9-H | Glacier Park - Fire Weather Station - 1985 |

### AQDHS - Standards Report

| | |
|---|---|
| AP-10-H | Libby - Lincoln County Courthouse - TSP - 1985 |
| AP-11-H | East Helena - Hastie - Lead - 1985 |

```
STATE: MONTANA (27)
                                                  AQDHS-II AIR QUALITY DATA REPORT
                                                                                             DISPLAY N>9997    PAGE   769
AQCR: 142   AGENCY(F):      STATE
CNTY: 0490  PROJECT(01):  POPULATION-ORIENTED SURV.      COLLECT METH:   HI-VOL               SLAMS/NAMS(2):    SLAMS
AREA: 0020  PARM(11101):  SUSPENDED PARTICULATE          ANALYSIS METH:  GRAVIMETRIC          RPT AGNCY/SMSA:       / 0000
SITE: 007   UNITS(01):      MICROGRAMS/CUBIC METER       SAMPLING INTR:  DAILY                UTM ZONE:         12
YEAR: 1985                                               SAROAD KEY:     27/0020/007/F/01     UTM EASTING:      349.9020
LOCALE: LINCOLN SCHOOL, CEDAR STREET                     MINIMUM DETEC:     1                 UTM NORTHING:     5109.5830
                                                ANACONDA                 DEER LODGE           TIME ZONE(05):    MOUNTAIN
                                         PRIMARY                                               SECONDARY
FEDERAL STANDARD   260 MICROGRAMS/CUBIC METER-24 HR MAX-1 PER YEAR          150 MICROGRAMS/CUBIC METER-24 HR MAX-1 PER YEAR
STATE STANDARD     200 MICROGRAMS/CUBIC METER-24 HR MAX-1 PER YEAR

                                                 MONTH
DAY     JAN      FEB      MAR      APR      MAY      JUN      JUL      AUG      SEP      OCT      NOV      DEC     NO.    MEAN     MAX
01       27                        159      119                                                                     3    101.7     159
02                         18                                                                                       1     18.       18
03                                                                                                38       12       2     25.       38
04                                                                                  30       50                     2     40.       50
05                                                                         24                                       1     24.       24
06                62                                 23       36                                                    3     40.33     62
07       93                        131       94                                                                     3    106.      131
08                         64                                                                                       1     64.       64
09                                                                                                57       55       2     56.       57
10                                                                                  28       98                     2     63.       98
11                                                                         12                                       1     12.       12
12                15                                 34       40                                                    3     29.67     40
13      106                        108       54                                                                     3     89.33    108
14                        167                                                                                       1    167.      167
15                                                                                               130       36       2     83.      130
16                                                                                  24       51                     2     37.5      51
17                                                                         26                                       1     26.       26
18                92                                 40       39                                                    3     57.       92
19       19                         34       52                                                                     3     35.       52
20                        245                                                                                       1    245.      245
21                                                                                                57       90       2     73.5      90
22                                                                                  24       29                     2     26.5      29
23                                                                         33                                       1     33.       33
24                                                   34       57                                                    2     45.5      57
25       98                         53       24                                                                     3     58.33     98
26                         42                                                                                       1     42.       42
27                                                                                                28       99       2     63.5      99
28                                                                                  21       46                     2     33.5      46
29                                                                         47                                       1     47.       47
30                                                   42       27                                                    2     34.5      42
31       73                                  28                                                                     2     50.5      73

NO        6        3        5        5        6        5        5        5        5        5        5        5     60
MEAN  69.33    56.33    107.2      97.    61.83     34.6     39.8     28.4     25.4     54.8      62.     58.4           58.23
MAX     106       92      245      159      119       42       57       47       30       98      130       99                    245
```

Figure AP-1-H

```
STATE: MONTANA (27)                           AQDHS-II AIR QUALITY DATA REPORT                               DISPLAY ND9997    PAGE   953

AQCR: 142  AGENCY(F):    STATE                                COLLECT METH:   HI-VOL                        SLAMS/NAMS(2):  SLAMS
CNTY: 0860 PROJECT(01): POPULATION-ORIENTED SURV.             ANALYSIS METH:  GRAVIMETRIC                   RPT AGNCY/SMSA:     / 0000
AREA: 0720 PARM(11101): SUSPENDED PARTICULATE                 SAMPLING INTR:  DAILY                         UTM ZONE:         12
SITE: 001  UNITS(01):   MICROGRAMS/CUBIC METER                SAROAD KEY:     27/0720/001/F/01              UTM EASTING:      422.2570
YEAR: 1985                                                    MINIMUM DETEC:     1                          UTM NORTHING:     5159.2990
LOCALE: COGSWELL BLDG #1 - LOCKEY AV & ROBERTS ST HELENA                      LEWIS & CLARK                 TIME ZONE(05):    MOUNTAIN
                                               PRIMARY                                                       SECONDARY
FEDERAL STANDARD  260 MICROGRAMS/CUBIC METER-24 HR MAX-1 PER YEAR           150 MICROGRAMS/CUBIC METER-24 HR MAX-1 PER YEAR
STATE STANDARD    200 MICROGRAMS/CUBIC METER-24 HR MAX-1 PER YEAR

                                                  MONTH

DAY      JAN     FEB     MAR     APR     MAY     JUN     JUL     AUG     SEP     OCT     NOV     DEC   NO.     MEAN    MAX

01        39                      61      97                                                             3    65.67     97
02                        25                                                                             1      25.     25
03                                                                                    28      32         2      30.     32
04                                                                    49      48                         2     48.5     49
05                                                            35                                         1      35.     35
06                48                                      82                                             2      65.     82
07        78                      38     116                                                             3    77.33    116
08                       188                                                                             1     188.    188
09                                                                                    25      36         2     30.5     36
10                                                                    20      89                         2     54.5     89
11                                                            10                                         1      10.     10
12                13                                                                                     1      13.     13
13        86                      72      54                                                             3    70.67     86
14                       189                                                                             1     189.    189
15                                                                                    52       8         2      30.     52
16                                                                    16      65                         2     40.5     65
17                                                            28                                         1      28.     28
18               273                              61      37                                             3    123.7    273
19        18                      32      79                                                             3      43.     79
20                       195                                                                             1     195.    195
21                                                                                    28     123         2     75.5    123
22                                                                    14      23                         2     18.5     23
23                                                            48                                         1      48.     48
24                18                              48      64                                             3    43.33     64
25        83                      25      27                                                             3      45.     83
26                        38                                                                             1      38.     38
27                                                                                    59     143         2     101.    143
28                                                                    22      42                         2      32.     42
29                                                            74                                         1      74.     74
30                                                54      33                                             2     43.5     54
31        69                              53                                                             2      61.     69

NO         6       4       5       5       6       3       4       5       5       5       5       5    58

MEAN   62.17     88.    127.    45.6     71.   54.33     54.     39.    24.2    53.4    38.4    68.4           60.52

MAX       86     273     195      72     116      61      82      74      49      89      59     143                   273
```

Figure AP-2-H

```
STATE: MONTANA (27)                                  AQDHS-II AIR QUALITY DATA REPORT                         DISPLAY N>9997    PAGE  1449

AQCR: 144  AGENCY(G):    COUNTY                            COLLECT METH:  HI-VOL                         SLAMS/NAMS(2):  SLAMS
CNTY: 1100 PROJECT(01):  POPULATION-ORIENTED SURV.         ANALYSIS METH: GRAVIMETRIC                    RPT AGNCY/SMSA:     / 0000
AREA: 1100 PARM(11101):  SUSPENDED PARTICULATE             SAMPLING INTR: DAILY                          UTM ZONE:       11
SITE: 020  UNITS(01):    MICROGRAMS/CUBIC METER            SAROAD KEY:    27/1100/020/G/01               UTM EASTING:    728.3870
YEAR: 1985                                                 MINIMUM DETEC:     1                          UTM NORTHING:   5193.4380
LOCALE: ROSE PARK - 1/2 BLOCK FROM HIWAY 93 S     MISSOULA                MISSOULA                       TIME ZONE(05):  MOUNTAIN
                                          PRIMARY                                                         SECONDARY
FEDERAL STANDARD  260 MICROGRAMS/CUBIC METER-24 HR MAX-1 PER YEAR         150 MICROGRAMS/CUBIC METER-24 HR MAX-1 PER YEAR
STATE STANDARD    200 MICROGRAMS/CUBIC METER-24 HR MAX-1 PER YEAR

                                                MONTH

DAY     JAN     FEB     MAR     APR     MAY     JUN     JUL     AUG     SEP     OCT     NOV     DEC   NO.     MEAN    MAX

01       84     115      44      57     101      20      40      35      42      90      61      34    12    60.25    115
02       93     106      83      84      95      18      19      19      23      96      59      42    12    61.42    106
03      143      62      81             100      22      63      33      25      36      62      40    11    60.64    143
04       56     103      64      46      34      29      60      35              69      40     131    11    60.64    131
05      126      87     117      48      26      25      63      27      32      71      32     159    12    67.75    159
06                       90      52      64      22      44      40              25             121     8    57.25    121
07      114      25     148      42      76      30      62      54      10      13      44     137    12    62.92    148
08       74      48     138      57      57      22      62      31       5      32      51      52    12    52.42    138
09       70      80     174      87      48      25      95      40      13      56      30     129    12    70.58    174
10       95      33     138              48      39      68      13      23      90      14     169    11    66.36    169
11       89      15     137      48      36      43      73      15      25      62      32     102    12    56.42    137
12       63      32     133      62      37      61      51      21      22      39      54      95    12    55.83    133
13      108             133      56      46      46      70      24      32      52             159    10     72.6    159
14      159                      55      65      42     106              22      61     100     120     9    81.11    159
15       61      55              74      63      43     114      36      15      44     137     128    11      70.    137
16      129     103              61              33      62              24      58     111     187     9    85.33    187
17      151      96      89      54      55      54      69      36      22      57      28            11    64.64    151
18      126     217     123      48      55      51      49      43      31      85      20      77    12    77.08    217
19       58     243     102      23      58      77      76      41      36      84      30      69    12    74.75    243
20       17      55     132      35      50      84      56      28      37      70      30      56    12    54.17    132
21       59      93      49      26      44      43      51      28              65      61      74    11    53.91     93
22      102      77      46      36      51      40      69      39              21      66     153    11    63.64    153
23       92     120      26      32      58      40      88      47              23      97     340    11    87.55    340
24       63      29      29      39      49      33      58      56      49      49      70     124    12      54.    124
25       83      62      46      26              47      58              48              33      79     9    53.56     83
26       71     134      36      35              38      57      61      66              56      76    10      63.    134
27       78     166      43      43      21      52      56               9      68      58      79    11    61.18    166
28       42     261      46      47      29      66      68      54      22      43      35      60    12    64.42    261
29       44              58      34      18      57      60      64      39      78      24     164    11    58.18    164
30                       37      63      20      48      48      65      66      76      16      83    10     52.2     83
31       71              38              38              41      41              32             171     7    61.71    171

NO       29      25      28      28      28      30      31      27      25      29      28      30   338

MEAN  86.93   96.68     85.   48.93    51.5   41.67    63.1     38.   29.52   56.72   51.82   113.7          63.92

MAX     159     261     174      87     101      84     114      65      66      96     137     340                    340
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Figure AP-3-H

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STATE: MONTANA (27)                                   AQDHS-II AIR QUALITY DATA REPORT                               DISPLAY N>9997     PAGE    419

AQCR: 140  AGENCY(F):     STATE                            COLLECT METH:  INSTRUMENTAL                          SLAMS/NAMS(1):   NAMS
CNTY: 1720 PROJECT(01):  POPULATION-ORIENTED SURV.        ANALYSIS METH: PULSED FLOURESCENT                    RPT AGNCY/SMSA:      / 0880
AREA: 0000 PARM(42401):  SULFUR DIOXIDE                   SAMPLING INTR: 01 HOURS                              UTM ZONE:        12
SITE: 065  UNITS(07):     PARTS PER MILLION               SARDAD KEY:    27/0080/C65/F/01                      UTM EASTING:     699.9040
YEAR: 1985 MONTH(01):     JANUARY                         MINIMUM DETEC:   .002                                UTM NORTHING:    5075.5660
LOCALE: LOCKWOOD PARK (NAMS SITE)                  BILLINGS                    YELLOWSTONE                     TIME ZONE(05):   MOUNTAIN
                                             PRIMARY                                                            SECONDARY
FEDERAL STANDARD  .14 PARTS PER MILLION-24 HR MAX-1 PER YEAR                          .5 PARTS PER MILLION-3 HR MEAN-1 PER YEAR
STATE STANDARD    .5 PARTS PER MILLION-1 HR MAX-18 PER YEAR


                                                 HOUR

DAY       00       01       02       03       04       05       06       07       08       09       10       11

01     0.090    0.091    0.155    0.154    0.147    0.081    0.032    0.018    0.033    0.033    0.038    0.024
02     0.030    0.081    0.032    0.073    0.062    0.054    0.054    0.064    0.053    0.046    0.039    0.030
03     0.016    0.015    0.004    0.018    0.005    0.017    0.058    0.009    0.055    0.094    0.077    0.054
04     0.043    0.082    0.049    0.064    0.040    0.073    0.061    0.058    0.039    0.027    0.015    0.030
05     0.054    0.062    0.109    0.060    0.044    0.036    0.041    0.073    0.068    0.053    0.038    0.036
06     0.042    0.004    0.009    0.032    0.028    0.008    0.003    0.002    0.023    0.043    0.125    0.132
07     0.005    0.004    0.014    0.017    0.021    0.016    0.013    0.013    0.013             0.024    0.067
08     0.002    0.002    0.003    0.002    0.003    0.002    0.003    0.003    0.002    0.003    0.002    0.003
09     0.006    0.004    0.005    0.006    0.010    0.009    0.024    0.014    0.016    0.018    0.016    0.007
10     0.003    0.006    0.004    0.001    0.001    0.000    0.001    0.000    0.000    0.000    0.000
11     0.005    0.017    0.029    0.171    0.280    0.130    0.056    0.038    0.033    0.054    0.079
12     0.054    0.069    0.065    0.077    0.085    0.073    0.059    0.074    0.081    0.070    0.048    0.067
13     0.021    0.072    0.041    0.123    0.096    0.059    0.117    0.134    0.097    0.100    0.146    0.117
14     0.064    0.041    0.016    0.007    0.011    0.016    0.008    0.010    0.020    0.027    0.031    0.024
15     0.022    0.015    0.013    0.022    0.008    0.013    0.015    0.008    0.006    0.010    0.000    0.000
16     0.000    0.000    0.000    0.007    0.004    0.009    0.010    0.010    0.035    0.053
17     0.021    0.022    0.019    0.031    0.034    0.026    0.042    0.036    0.028    0.051    0.014    0.007
18     0.011    0.015    0.010    0.014    0.014    0.011    0.008    0.010    0.020    0.033    0.049    0.047
19     0.008    0.007    0.007    0.007    0.008    0.007    0.007    0.010    0.010    0.011    0.012    0.012
20     0.011    0.011    0.010    0.011    0.012    0.012    0.013    0.014    0.019    0.017    0.017    0.025
21     0.027    0.030    0.030    0.028    0.027    0.031    0.025    0.024    0.022    0.021    0.036    0.088
22     0.023    0.045    0.045    0.056    0.054    0.055    0.061    0.051    0.046                      0.040
23     0.054    0.061    0.053    0.067    0.052    0.046    0.045    0.047    0.045    0.038    0.020    0.029
24     0.100    0.102    0.061    0.058    0.077    0.069    0.053    0.054    0.060    0.042             0.063
25     0.250    0.219    0.084    0.031    0.029    0.055    0.079    0.065    0.088    0.068    0.087    0.064
26     0.055    0.037    0.023    0.037    0.048    0.067    0.063    0.064    0.074    0.082    0.090    0.179
27     0.012    0.010    0.015    0.013    0.013    0.013    0.017    0.019    0.029    0.056    0.039    0.028
28                                                                           0.024    0.017    0.014    0.013
29     0.020    0.043    0.035    0.024    0.018    0.025    0.014    0.013    0.011    0.012    0.012    0.012
30     0.011    0.011    0.011    0.012    0.012    0.017    0.013    0.014    0.027    0.044    0.073
31     0.145    0.103    0.092    0.075    0.082    0.041    0.030    0.059    0.045

NO        30       30       30       30       30       30       30       30       31       28       27       26

MEAN   .0401    .0427    .0347     .043    .0441    .0357    .0341    .0336    .0361    .0401    .0422     .046

MAX    0.250    0.219    0.155    0.171    0.280    0.130    0.117    0.134    0.097    0.100    0.146    0.179
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Figure AP-4a-H

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STATE: MONTANA (27)                          AQDHS-II AIR QUALITY DATA REPORT                          DISPLAY ND9997    PAGE   420

AQCR: 140   AGENCY(F):     STATE                         COLLECT METH:   INSTRUMENTAL               SLAMS/NAMS(L):   NAMS
CNTY: 1720  PROJECT(01):   POPULATION-ORIENTED SURV.     ANALYSIS METH:  PULSED FLOURESCENT         RPT AGNCY/SMSA:      / 0880
AREA: 0080  PARM(42401):   SULFUR DIOXIDE                SAMPLING INTR:  01 HOURS                   UTM ZONE:        12
SITE: 065   UNITS(07):     PARTS PER MILLION             SAROAD KEY:     27/0080/065/F/01           UTM EASTING:     699.9040
YEAR: 1985  MONTH(01):     JANUARY                       MINIMUM DETEC:    .002                     UTM NORTHING:    5075.5660
LOCALE: LOCKWOOD PARK (NAMS SITE)                    BILLINGS                YELLOWSTONE            TIME ZONE(05):   MOUNTAIN
                                            PRIMARY                                                  SECONDARY
FEDERAL STANDARD   .14 PARTS PER MILLION-24 HR MAX-1 PER YEAR                         .5 PARTS PER MILLION-3 HR MEAN-1 PER YEAR
STATE STANDARD     .5 PARTS PER MILLION-1 HR MAX-18 PER YEAR

                                             HOUR

DAY       12      13      14      15      16      17      18      19      20      21      22      23   NO.    MEAN     MAX

01     0.043   0.022   0.030   0.032   0.024   0.040   0.050   0.014   0.033   0.015   0.021   0.086    24   .0544   0.155
02     0.028   0.026   0.013   0.056   0.050   0.065   0.061   0.071   0.057   0.083   0.077   0.070    24   .0531   0.083
03     0.072   0.062   0.035   0.004   0.007   0.012   0.036   0.035   0.031   0.004   0.035   0.088    24   .0351   0.094
04                     0.009   0.006   0.005   0.005   0.007   0.013   0.019   0.080   0.025   0.034    22   .0356   0.082
05     0.015   0.031   0.007   0.039   0.046   0.057   0.048   0.018   0.023   0.054   0.003   0.004    24   .0424   0.109
06     0.060   0.057   0.029   0.005   0.002   0.005   0.005   0.015   0.006   0.005   0.005   0.007    24   .0271   0.132
07     0.051   0.033   0.014   0.007   0.006   0.005   0.004   0.004   0.005   0.003   0.003   0.002    23   .0149   0.067
08     0.003   0.002   0.000                           0.012   0.003   0.003   0.004   0.003   0.004    21    .003   0.012
09     0.008   0.009   0.009   0.009   0.010   0.006   0.003   0.002   0.002   0.002   0.003   0.002    24   .0083   0.024
10                                                                     0.005   0.003   0.002   0.003    15   .0019   0.006
11             0.051   0.035   0.026   0.018   0.020   0.020   0.053   0.053   0.047   0.046   0.065    22   .0602   0.280
12     0.083   0.079   0.047   0.043   0.046   0.027   0.031   0.037   0.069   0.050   0.071   0.044    24     .06   0.085
13     0.105   0.056   0.028   0.023   0.015   0.020   0.016   0.014   0.034   0.098   0.092   0.081    24   .0709   0.146
14     0.023   0.028   0.032                   0.033   0.029   0.029   0.037   0.022   0.014   0.066    22   .0267   0.066
15     0.009   0.042   0.100   0.055   0.045   0.008   0.060   0.000   0.000   0.000   0.000   0.000    24   .0187   0.100
16     0.006   0.015   0.026   0.011   0.017   0.014   0.022   0.018   0.017   0.011   0.012   0.018    22   .0143   0.053
17     0.007   0.007   0.007   0.009   0.005   0.009   0.016   0.021   0.010   0.008   0.027   0.035    24   .0205   0.051
18     0.045   0.025   0.014   0.012   0.039   0.009   0.011   0.010   0.010   0.008   0.008   0.007    24    .017   0.049
19     0.012   0.011   0.010   0.010   0.009   0.013   0.010   0.010   0.011   0.010   0.011   0.011    24   .0096   0.012
20     0.027   0.019   0.013   0.011   0.010   0.010   0.011   0.011   0.011   0.012   0.028   0.039    24   .0155   0.039
21     0.121   0.079   0.040   0.059   0.026   0.018   0.013   0.013   0.013   0.014   0.020   0.021    24   .0344   0.121
22     0.034   0.032   0.041   0.030   0.046   0.052   0.033   0.040   0.031   0.042   0.038   0.043    22   .0426   0.061
23     0.058   0.061   0.063   0.058   0.036   0.061   0.040   0.071   0.083   0.072   0.069   0.038    24   .0527   0.083
24     0.076   0.062   0.034   0.040   0.048   0.056   0.060   0.069   0.212   0.398   0.494   0.326    23   .1136   0.494
25                     0.191   0.210   0.162   0.187   0.232   0.144   0.057   0.097   0.092   0.048    22   .1154   0.250
26     0.083   0.058   0.017   0.011   0.013   0.013   0.016   0.015   0.013   0.012   0.013   0.011    24   .0455   0.179
27     0.023   0.024   0.020   0.024   0.020   0.016   0.014   0.012   0.012                            21   .0204   0.056
28     0.012   0.011   0.012   0.011   0.011   0.011   0.010   0.011   0.011   0.017   0.045   0.029    16   .0161   0.045
29     0.012   0.013   0.012   0.012   0.011   0.012   0.011   0.012   0.011   0.011   0.011   0.010    24   .0157   0.043
30                             0.066   0.069   0.028   0.015   0.016   0.014   0.016   0.135   0.194    20   .0399   0.194
31                                                                                                      9   .0746   0.145

NO        25      26      28      27      27      28      29      29      30      29      29      29   688

MEAN   .0406   .0351   .0317   .0325   .0283   .0288   .0308   .0269   .0297   .0413   .0483   .0477           .0372

MAX    0.121   0.079   0.191   0.210   0.162   0.187   0.232   0.144   0.212   0.398   0.494   0.326                   0.494
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Figure AP-4b-H

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STATE: MONTANA (27)                                   AQDHS-II AIR QUALITY DATA REPORT                                  DISPLAY N>9997     PAGE    693

AQCR: 141   AGENCY(G):    COUNTY                                   COLLECT METH:  INSTRUMENTAL                    SLAMS/NAMS(2):   SLAMS
CNTY: 0220  PROJECT( 2):  SOURCE-ORIENTED AMBIENT SURV.            ANALYSIS METH: NONDISPERSIVE INFRA-RED         RPT AGNCY/SMSA:      / 3040
AREA: 0660  PARM(42101):  CARBON MONOXIDE                          SAMPLING INTR: 01 HOURS                        UTM ZONE:        12
SITE: 023   UNITS(07):    PARTS PER MILLION                        SARDAD KEY:    27/0660/023/G/02                UTM EASTING:     478.0000
YEAR: 1985  MONTH(01):    JANUARY                                  MINIMUM DETEC:     .5                          UTM NORTHING:    5259.8800
LOCALE: PARDIS CLINIC - 826 10TH AVE SOUTH          GREAT FALLS               CASCADE                             TIME ZONE(05):   MOUNTAIN
                                            PRIMARY                                                                SECONDARY
FEDERAL STANDARD  35 PARTS PER MILLION-1 HR MAX-1 PER YEAR                      9 PARTS PER MILLION-8 HR MAX-1 PER YEAR
STATE STANDARD    23 PARTS PER MILLION-1 HR MAX-1 PER YEAR

                                                    HOUR

DAY     00      01      02      03      04      05      06      07      08      09      10      11

01      2.6     2.6     2.4     2.7     3.3     2.1     1.2     0.7     0.5     0.5     0.4     0.5
02      0.5     0.4     0.4     0.4     0.4     0.3     0.4     0.4     0.5     0.5     0.5
03      0.4     0.4     0.4     0.3     0.3     0.3     0.4     0.5     0.5     0.5     0.5     0.8
04      4.7     3.5     3.1     2.5     2.1     2.2     3.2     3.0     1.5     1.1             0.8
05      0.4     0.4     0.4     0.3     0.4     0.3     0.4     0.5     0.6     0.6     0.7     0.8
06      1.4     1.0     0.9     0.7
07                                                                                              3.5
08      2.9     2.3     2.0     1.6     1.2     1.1     1.3     1.9     2.7     2.9     3.2     3.2
09      1.1     0.9     1.1     0.9     0.8     0.8     0.8     1.3     1.8     1.7             2.1
10      3.5     3.2     2.4     1.9     1.5     1.3     1.4     2.0     3.0     3.6     3.8     4.4
11      3.5     2.8     2.7     2.2     1.8     1.7     1.6     2.0     2.4     2.4     3.1     3.5
12
13      1.2     1.7     1.8     1.5     1.6     1.9     3.4     4.6     5.6     5.6     5.3     4.3
14      6.4     5.8     4.3     3.1     2.3
15      0.8     0.8     0.9     0.8     0.9     0.9     0.9     1.5     1.7     1.6     1.7     1.9
16      1.0     1.0     0.9     0.9     0.9     0.8     0.9     1.0     1.0     1.0     1.0     1.0
17      0.8     0.8     0.8     0.7     0.8     0.8     0.8     1.0     1.3     1.2     1.4
18      2.9     3.5     2.9     3.4     3.7     3.4     3.4     3.3     5.2     6.3     4.5     4.0
19      2.1     1.8     1.6     1.4     1.3     1.2     1.2     1.4     1.7     2.4     2.8     3.1
20      2.2     2.0     1.8     1.5     1.3     1.2     1.2     1.3     1.4     1.6     2.0     2.3
21                                                                                      5.6     4.0
22      3.5     3.4     2.5     1.7     1.7     1.7     2.6     4.8     3.3     2.0     1.6     1.2
23      1.3     0.9     0.8     0.7     0.6     0.6     0.6     0.7     0.7     0.8     1.0     1.2
24      3.1     1.8     1.5     1.2     0.9     0.9     1.1     2.1     3.6     2.9     2.7     1.5
25      2.0     1.2     0.8     0.5     0.2     0.1     0.1     0.2     0.2     0.2     0.2     0.5
26     10.7     6.7     5.3     4.2     2.9     2.0     1.6     1.4     1.8     1.8     1.1     1.2
27      5.3     5.2     4.9     3.5     2.4     2.0     1.5     1.8     2.2     2.8     3.0     2.8
28      0.9     0.7     0.6     0.5     0.5     0.5     0.6     1.4     1.9     1.3     0.8     0.8
29      0.4     0.5     0.3     0.2     0.2     0.2     0.6     1.2     1.9     2.0     2.3     2.9
30      1.5     1.7     1.4     1.1     1.0     0.9     0.9     1.4     2.0     2.6     2.3     1.8
31      1.8     1.4     1.4     0.9     0.7     0.6     0.6     1.1     1.5     1.4     1.6     1.6

NO       28      28      28      28      27      26      26      26      26      26      25      26

MEAN  2.461   2.089   1.796   1.475   1.322   1.146   1.258   1.635   1.942   1.973   2.124   2.142

MAX    10.7     6.7     5.3     4.2     3.7     3.4     3.4     4.8     5.6     6.3     5.6     4.4
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Figure AP-5a-H

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STATE: MONTANA (27)                                     AQDHS-II AIR QUALITY DATA REPORT                          DISPLAY N>9997    PAGE   694

AQCR: 141  AGENCY(G):    COUNTY                                COLLECT METH:  INSTRUMENTAL                   SLAMS/NAMS(2):  SLAMS
CNTY: 0220 PROJECT(22): SOURCE-ORIENTED AMBIENT SURV.          ANALYSIS METH: NONDISPERSIVE INFRA-RED        RPT AGNCY/SMSA:     / 3040
AREA: 0660 PARM(42101): CARBON MONOXIDE                        SAMPLING INTR: 01 HOURS                       UTM ZONE:       12
SITE: 023  UNITS(07):   PARTS PER MILLION                      SAROAD KEY:    27/0660/023/G/C2               UTM EASTING:    478.0000
YEAR: 1985 MONTH(01):   JANUARY                                MINIMUM DETEC:    .5                          UTM NORTHING:   5259.8800
LOCALE: PARDIS CLINIC - 826 10TH AVE SOUTH          GREAT FALLS                 CASCADE                      TIME ZONE(05):  MOUNTAIN
                                          PRIMARY                                                             SECONDARY
FEDERAL STANDARD  35 PARTS PER MILLION-1 HR MAX-1 PER YEAR                                9 PARTS PER MILLION-8 HR MAX-1 PER YEAR
STATE STANDARD    23 PARTS PER MILLION-1 HR MAX-1 PER YEAR

                                                          HOUR

DAY      12       13       14       15       16       17       18       19       20       21       22       23     NO.    MEAN      MAX

01       0.5      0.5      0.7      0.6      0.6      0.6      0.7      0.7      0.6      0.8      0.7      0.7     24    1.133      3.3
02       1.5      0.8      0.6      0.5      0.6      0.6      0.6      0.7      0.5      0.5      0.7      0.5     23    .5565      1.5
03       1.3      1.0      0.9      0.9      0.8      1.1      1.1      1.0      1.0      1.9      3.8      6.3     24      1.1      6.3
04       1.4      0.8      0.9      0.7      0.9      0.7      0.6      0.5      1.2      0.8      0.7      0.5     23    1.626      4.7
05       1.2      1.1      0.9      0.8      1.0      0.9      1.0      1.2      1.1      1.4      1.2      1.3     24    .7875      1.4
06                                                                                                                 4       1.      1.4
07       4.0      3.8      3.4      4.6      6.0      6.7      6.0      5.7      4.7      4.4      4.0      3.5     13    4.638      6.7
08       3.3      2.8      3.3      3.4      3.2      2.7      2.6      2.2      1.9      1.8      1.5      1.4     24     2.35      3.4
09       2.5      2.8      2.9      2.5      3.0      3.8      3.9      4.4      3.9      4.5      4.8      4.2     23    2.457      4.8
10       4.8      5.0      5.1      5.3      5.4      6.4      6.0      5.3      4.8      4.4      3.9      4.0     24     3.85      6.4
11       4.2      4.9      5.0      3.2      2.4      1.7      1.5      1.2      1.3      1.3      1.4      1.3     24    2.463      5.0
12                                           1.2      1.1      1.7      1.4      1.2      1.3      1.2      1.2      8    1.288      1.7
13       3.8      3.3      2.4      2.3      4.2      9.1      9.5      8.6      7.7      8.5      8.1      6.9     24    4.704      9.5
14                1.5      1.4      1.1      1.1      1.2      1.0      0.9      0.9      0.9      0.9      0.9     16    2.113      6.4
15       2.9      2.6      3.1      3.6      3.8      4.1      2.2      2.0      1.9      1.6      1.5      1.2     24    1.871      4.1
16       1.3      1.2      1.1      1.0      1.0      1.1      1.0      1.2      1.0      1.0      0.9      0.8     24      1.       1.3
17       2.4      2.2      2.2      2.2      2.8      5.6      5.4      5.0      3.9      4.1      3.4      3.3     23      2.3      5.6
18       4.3      3.3      3.4      4.3      5.4     10.8      6.7      5.1      3.7      3.4      2.6      2.4     24     4.25     10.8
19       3.9      4.0      4.4      4.7      4.8      4.4      4.2      3.7      3.0      3.1      2.9      2.6     24    2.821      4.8
20       2.7      3.0      3.4      3.6      3.5      3.4      3.2      2.9      3.3      2.7      2.4      2.5     24    2.338      3.6
21       3.7      3.0      2.9      3.4      4.9      7.0      8.9      8.7      7.0      5.5      4.3      3.5     14    5.171      8.9
22       1.2      1.0      0.9      1.0      1.1      2.1      2.2      2.3      1.4      2.3      2.0      1.6     24    2.046      4.8
23       1.4      1.3               1.3      2.8      4.3      4.4      4.1      6.2      6.5      3.0      3.4     23    2.113      6.5
24       0.9      0.5      0.5      0.5      0.8      3.0      6.3      8.9      3.5      4.3      3.5      1.9     24    2.413      8.9
25       0.8      0.5      1.0      4.3      4.1      6.6      7.1     10.0      5.9      6.4      9.0      9.8     24    2.988     10.0
26       1.5      1.5      1.7      1.8      3.4      5.0      7.5      7.6      8.2      8.8      6.7      5.7     24    4.171     10.7
27       2.4      1.7      1.1      1.2      2.7      2.8      2.8      2.2      1.8      1.5      1.4      1.1     24    2.504      5.3
28       0.9      1.1      1.8      1.9      1.5      2.0      2.1      2.1      1.5      1.3      1.1      0.8     24    1.192      2.1
29       3.1      3.2      3.1      3.2      4.1      3.2      3.2      2.7      2.5      2.2      2.0      1.7     24    1.954      4.1
30       1.7      1.9               1.5      1.2      1.6      2.4      2.6      2.8      3.1      2.6      2.4     23    1.843      3.1
31       2.5      1.9      2.3      2.5      3.1      3.2      2.7      2.6      1.9      1.5      1.2      1.2     24    1.717      3.2

NO        28       29       27       29       30       30       30       30       30       30       30       30    673

MEAN   2.361    2.148    2.237    2.341    2.713     3.56    3.617    3.583       3.     3.06     2.78     2.62            2.340

MAX      4.8      5.0      5.1      5.3      6.0     10.8      9.5     10.0      8.2      8.8      9.0      9.8                     10.8
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Figure AP-5b-H

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                                        AQDHS-II STATISTICAL ANALYSIS REPORT
                                                ANALYSIS BY MONTH
                                              STATE (27): MONTANA

SITE CODE: 27-0720-013-G-05        AGENCY TYPE: COUNTY                                 COUNTY: 0860
AGENCY/PROJECT: G05          SITE ADDRESS: CAPITAL COURTS - 1013 DEARBORN AVE                CITY: HELENA

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POLLUTANT NAME                   METHOD OF COLLECTION AND ANALYSIS                         INTERVAL    UNITS                   TIMES
POLLUTANT-METHOD-INTERVAL-UNITS CODE                                                                                           HALF
        PCT    NBR    MIN     MIN                      PERCENTILES                    MAX     2ND     3RD     ARIT    ARIT     GEOM    GEOM   M DET
YR/MON  OBS    OBS   DETEC    OBS      10     30     50     70     90     95     99     OBS     MAX     MAX     MEAN   ST DEV   MEAN   ST DEV  SUB
-----------------------------------------------------------------------------------------------------------------------
SUSPENDED PARTICULATE            HI-VOL                   - GRAVIMETRIC                    DAILY       MICROGRAMS/CUBIC METER
11101-91-8-01
85/01   19.4      6  1.000 15.00      15.    45.    63.    86.    95.    95.    95.   95.00   86.00   78.00   63.66   29.57    54.80   1.989      0
85/02   14.3      4  1.000 16.00      16.    20.    20.    42.   397.   397.   397.   397.0   42.00   20.00   118.7   185.8    48.06   4.335      0
85/03   16.1      5  1.000 19.00      19.    48.   193.   210.   213.   213.   213.   213.0   210.0   193.0   136.6   94.98    95.33   3.004      0
85/04   16.7      5  1.000 25.00      25.    32.    52.    57.    81.    81.    81.   81.00   57.00   52.00   49.40   22.14    45.36   1.600      0
85/05   19.4      6  1.000 33.00      33.    37.    59.    72.   105.   105.   105.   105.0   72.00   64.00   61.66   26.18    57.15   1.538      0
85/06   16.7      5  1.000 29.00      29.    41.    42.    58.    58.    58.    58.   58.00   58.00   42.00   45.60   12.42    44.16   1.334      0
85/07   16.1      5  1.000 48.00      48.    52.    65.    77.   113.   113.   113.   113.0   77.00   65.00   71.00   26.10    67.59   1.408      0
85/08   16.1      5  1.000 13.00      13.    39.    42.    65.    68.    68.    68.   68.00   65.00   42.00   45.40   22.34    39.33   1.949      0
85/09   16.7      5  1.000 17.00      19.    20.    27.    28.    38.    38.    38.   38.00   28.00   27.00   26.40   7.635    25.56   1.325      0
85/10   12.9      4  1.000 24.00      24.    74.    74.    74.   127.   127.   127.   127.0   74.00   74.00   74.75   42.05    63.91   2.015      0
85/11   16.7      5  1.000 32.00      32.    34.    44.    64.    73.    73.    73.   73.00   64.00   44.00   49.40   18.29    46.76   1.447      0
85/12   16.1      5  1.000 9.000       8.    31.    48.   155.   159.   159.   159.   159.0   155.0   48.00   80.20   71.54    49.37   3.475      0
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Figure AP-6-H

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                                        AQUIS-II STATISTICAL ANALYSIS REPORT
                                                ANALYSIS BY MONTH
                                              STATE (27): MONTANA

SITE CODE: 27-0080-264-F-05      AGENCY TYPE: STATE                                     COUNTY: 1720
AGENCY/PROJECT: F05         SITE ADDRESS: NORTH JOHNSON LANE                                  CITY: BILLINGS
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POLLUTANT NAME                         METHOD OF COLLECTION AND ANALYSIS                    INTERVAL    UNITS                   TIMES
POLLUTANT-METHOD-INTERVAL-UNITS CODE                                                                                          HALF
        PCT    NBR    MIN     MIN                      PERCENTILES                 MAX     2ND     3RD     ARIT    ARIT     GEOM   GEOM    M DET
YR/MON  OBS    OBS   DETEC    OBS       10     30     50     70     90     95     99     OBS     MAX     MAX     MEAN   ST DEV   MEAN   ST DEV  SUB
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SULFUR DIOXIDE                         INSTRUMENTAL              - PULSED FLOURESCENT      HOURLY      PARTS PER MILLION
42401-20-1-07
85/01   96.0   714  0.002 0.000   0.000 0.000 0.009 0.040 0.136 0.189 0.309   0.414   0.410   0.377   0.041   0.067   0.008  7.510   290
85/02   78.0   524  0.002 0.000   0.000 0.000 0.004 0.019 0.068 0.110 0.199   0.274   0.254   0.227   0.022   0.039   0.005  5.802   240
85/03   90.7   675  0.002 0.000   0.000 0.000 0.000 0.007 0.052 0.096 0.203   0.351   0.297   0.291   0.017   0.039   0.003  5.381   395
85/04   86.5   623  0.002 0.000   0.000 0.000 0.000 0.002 0.025 0.052 0.135   0.219   0.196   0.188   0.009   0.024   0.002  3.948   421
85/05   74.7   556  0.002 0.000   0.000 0.000 0.000 0.002 0.027 0.067 0.157   0.219   0.214   0.183   0.011   0.028   0.002  4.309   377
85/06   98.6   710  0.002 0.000   0.000 0.000 0.000 0.003 0.026 0.046 0.128   0.313   0.245   0.217   0.009   0.025   0.002  4.014   480
85/07   99.3   739  0.002 0.000   0.000 0.000 0.001 0.010 0.052 0.101 0.180   0.364   0.256   0.226   0.017   0.037   0.003  5.295   394
85/08   27.8   207  0.002 0.000   0.000 0.000 0.000 0.003 0.031 0.069 0.133   0.187   0.147   0.133   0.010   0.026   0.002  4.303   136
85/09   62.1   447  0.002 0.000   0.000 0.000 0.000 0.000 0.018 0.029 0.097   0.155   0.153   0.106   0.006   0.017   0.001  3.495   334
85/10   99.5   740  0.002 0.000   0.000 0.003 0.007 0.016 0.054 0.082 0.191   0.329   0.254   0.204   0.019   0.034   0.007  4.155   143
85/11   99.2   714  0.002 0.000   0.000 0.003 0.005 0.011 0.041 0.075 0.203   0.367   0.292   0.229   0.016   0.035   0.006  3.864   136
85/12   86.0   640  0.002 0.000   0.000 0.004 0.011 0.032 0.100 0.144 0.209   0.345   0.232   0.221   0.033   0.048   0.010  5.447   141

WIND SPEED                             INSTRUMENTAL              - DAS/MANUAL AVERAGE      HOURLY      METERS PER SECOND
61101-50-1-11
85/01   79.7   593  0.300 0.000    0.6    1.3    2.4    3.3    5.1    5.7    7.0   7.700   7.700   7.300   2.549   1.695   1.915  2.325     8
85/02   78.9   530  0.300 0.100    0.5    1.5    2.3    3.4    5.3    5.9    7.1   7.600   7.400   7.200   2.686   1.719   2.052  2.281     7
85/03   97.3   724  0.300 0.000    0.5    1.1    1.8    2.6    5.1    6.3    7.5   8.200   8.200   8.100   2.266   1.793   1.622  2.414    20
85/04  100.0   720  0.300 0.100    0.8    1.5    2.4    3.5    5.7    6.6    7.7   8.500   8.500   8.200   2.826   1.882   2.202  2.125     3
85/05   98.4   732  0.300 0.000    0.5    1.2    1.8    2.8    4.3    5.1    6.5   7.500   7.300   7.200   2.221   1.477   1.722  2.171    11
85/06   83.3   600  0.300 0.200    0.7    1.2    1.9    2.9    4.3    4.8    6.4   8.000   7.700   6.900   2.223   1.404   1.786  2.019     2
85/07  100.0   744  0.300 0.100    0.6    1.2    1.8    2.7    3.8    4.4    6.5   7.900   7.900   7.800   2.080   1.332   1.650  2.099    11
85/08   90.2   671  0.300 0.100    0.6    1.2    1.8    2.5    4.1    4.9    6.4   8.000   7.500   7.200   2.092   1.392   1.650  2.098    11
85/09   95.3   686  0.300 0.000    0.6    1.2    1.9    2.9    4.5    5.1    7.4   8.900   8.600   8.200   2.279   1.561   1.756  2.191    12
85/10  100.0   744  0.300 0.100    0.6    1.1    1.7    2.9    5.0    5.7    7.7   8.800   8.500   8.300   2.307   1.754   1.698  2.293    10
85/11   88.9   640  0.300 0.000    0.5    1.2    2.0    3.1    4.2    5.2    7.0   8.400   7.900   7.600   2.308   1.545   1.759  2.245     8
85/12   99.9   743  0.300 0.000    0.7    1.7    2.6    3.5    5.2    6.1    9.1   9.800   9.500   9.200   2.818   1.781   2.163  2.306    19

WIND DIRECTION                         INSTRUMENTAL              - DAS/MANUAL AVERAGE      HOURLY      DEGREES
61102-50-1-14
85/01   79.2   589  1.000 0.000    22.    70.   200.   218.   241.   300.   346.   359.0   356.0   354.0   160.8   93.07   108.9  3.251     3
85/02   78.9   530  1.000 2.000    37.   130.   213.   229.   279.   303.   344.   359.0   356.0   353.0   186.6   84.30   148.2  2.404     0
85/03   97.3   724  1.000 0.000    25.   114.   213.   252.   308.   331.   355.   359.0   358.0   358.0   183.3   106.4   124.7  3.201     4
85/04  100.0   720  1.000 0.000    44.   190.   225.   261.   306.   332.   357.   360.0   360.0   360.0   206.3   91.63   165.9  2.353     1
85/05   98.4   732  1.000 0.000    30.   113.   214.   258.   311.   336.   355.   359.0   359.0   358.0   188.4   104.3   135.6  2.829     1
85/06   83.3   600  1.000 0.000    29.    69.   199.   237.   313.   341.   356.   359.0   358.0   358.0   169.3   109.8   114.5  3.004     2
85/07  100.0   744  1.000 1.000    20.    61.   200.   233.   319.   339.   356.   358.0   358.0   358.0   166.3   111.7   105.1  3.335     0
85/08   90.2   671  1.000 0.000    21.    72.   209.   249.   322.   341.   354.   359.0   359.0   359.0   177.2   112.5   114.0  3.382     4
85/09   95.4   687  1.000 0.000    14.    45.   177.   231.   319.   341.   357.   359.0   359.0   358.0   155.5   115.5   90.96  3.648     1
85/10  100.0   744  1.000 0.000    38.   186.   219.   249.   308.   337.   355.   359.0   358.0   358.0   203.3   89.87   161.6  2.458     1
85/11   88.9   640  1.000 0.000    17.    41.   158.   217.   322.   348.   357.   359.0   359.0   357.0   145.9   115.7   84.60  3.554     1
85/12   99.9   743  1.000 0.000    53.   201.   222.   239.   306.   328.   352.   358.0   357.0   356.0   211.9   81.77   171.3  2.547     2
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Figure AP-7-H

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                                          AQDHS-II STATISTICAL ANALYSIS REPORT                                         PAGE    98
                                                   ANALYSIS BY YEAR
                                                 STATE (27): MONTANA

SITE CODE: 27-0860-714-F-02       AGENCY TYPE: STATE                                  COUNTY: 0860
AGENCY/PROJECT: F02        SITE ADDRESS: FIREHALL - 2 EAST PACIFIC ST                        CITY: EAST HELENA

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POLLUTANT NAME                         METHOD OF COLLECTION AND ANALYSIS                        INTERVAL    UNITS                            TIMES
POLL-METH-INTRV-UNITS CODE                                                                                                                HALF
       PCT    NBR    MIN      MIN                        PERCENTILES                        MAX      2ND     3RD     ARIT   ARIT     GEOM    GEOM    M DET
 YEAR  OBS    OBS    DETEC    OBS      10     30     50     70     90     95     99     OBS      MAX     MAX     MEAN   ST DEV   MEAN   ST DEV   SUB
-----------------------------------------------------------------------------------------------------------------------------------
SUSPENDED PARTICULATE                  HI-VOL                         - GRAVIMETRIC                   DAILY       MICROGRAMS/CUBIC METER
11101-91-8-01
  85   31.5   115  1.000 12.00     32.    45.    61.    83.   112.   143.   207.   215.0   207.0   170.0    67.91   37.13    59.27  1.699        0

ARSENIC                                HI-VOL                         - EMISSION SPECTRA ICAP         DAILY       MICROGRAMS/CUBIC METER
12103-92-8-01
  85    7.9    29  0.020 0.000   0.059 0.184 0.295 0.508 0.798 0.869 2.710   2.710   0.869   0.798    0.421   0.501    0.251  3.159        1

CADMIUM                                HI-VOL                         - EMISSION SPECTRA ICAP         DAILY       MICROGRAMS/CUBIC METER
12112-92-8-01
  85    7.9    29  0.003 0.008   0.024 0.095 0.160 0.229 0.467 0.491 0.513   0.513   0.491   0.467    0.186   0.139    0.129  2.788        0

COPPER                                 HI-VOL                         - EMISSION SPECTRA ICAP         DAILY       MICROGRAMS/CUBIC METER
12114-92-8-01
  85   31.5   115  0.003 0.050    0.59   1.65   2.64   5.39  11.77  23.36  49.08   64.52   49.08   36.65    5.885   9.363    2.820  3.499        0

LEAD                                   HI-VOL                         - EMISSION SPECTRA ICAP         DAILY       MICROGRAMS/CUBIC METER
12128-92-8-01
  85   31.5   115  0.010 0.140    0.47   1.18   2.49   4.23   7.16  11.47  12.99   17.08   12.99   12.98    3.346   3.190    2.085  2.899        0

ZINC                                   HI-VOL                         - EMISSION SPECTRA ICAP         DAILY       MICROGRAMS/CUBIC METER
12167-92-8-01
  85   31.5   115  0.010 0.100    0.23   0.62   1.27   1.90   3.61   4.32   5.79   5.860   5.790   4.710    1.552   1.328    1.031  2.699        0
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Figure AP-8-H

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                                        AQDHS-II STATISTICAL ANALYSIS REPORT                                   PAGE  292
                                                 ANALYSIS BY YEAR
                                               STATE (27): MONTANA

SITE CODE: 27-0570-007-F-02        AGENCY TYPE: STATE                                COUNTY: 0480
AGENCY/PROJECT: F02        SITE ADDRESS: GLACIER NATL PARK # 5, FIRE WEATHER STATN        CITY:

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POLLUTANT NAME                      METHOD OF COLLECTION AND ANALYSIS                    INTERVAL    UNITS                       TIMES
POLL-METH-INTRU-UNITS CODE                                                                                                    HALF
        PCT    NBR    MIN      MIN                   PERCENTILES                  MAX      2ND      3RD     ARIT    ARIT     GEOM    GEOM   M DET
 YEAR   OBS    OBS   DETEC     OBS       10     30     50     70     90     95     99     OBS      MAX      MAX     MEAN   ST DEV    MEAN  ST DEV  SUB
----------------------------------------------------------------------------------------------------------------------------
SUSPENDED PARTICULATE               HI-VOL                      - GRAVIMETRIC                   DAILY        MICROGRAMS/CUBIC METER
11101-91-8-01
  85    15.1    55  1.000 3.000      4.     9.    15.    17.    29.    41.    48.   48.00   44.00   41.00   15.52   10.78   12.16  2.086     0

NITRATE                             HI-VOL                      - REDUCTION-DIAZO COUPLING      DAILY        MICROGRAMS/CUBIC METER
12306-92-8-01
  85    15.1    55  0.050 0.000     0.2    0.3    0.4    0.6    0.9    1.4    1.7   1.700   1.700   1.400   0.520   0.361   0.406  2.176     1

SULFATE                             HI-VOL                      - COLORIMETRIC                  DAILY        MICROGRAMS/CUBIC METER
12403-91-8-01
  85    15.1    55  0.500 0.400     0.6    1.2    1.5    2.0    2.8    4.2    6.0   6.000   5.700   4.200   1.771   1.138   1.485  1.343     1
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Figure AP-9-H

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                                   [illegible] STANDARD REPORT FROM JAN 1985 TO DEC 1985                                PAGE    62
                                                  P A R T I C U L A T E
REPORT DATE: [illegible]                              DAILY VALUES                                   STATE (27): MONTANA

SITE CODE: [illegible]-012                     LOCATION: LIBBY                                       LATITUDE:          D.    M.    S.
AGENCY (F): STATE                               COUNTY (0240): LINCOLN                                LONGITUDE:         D.    M.    S.
PROJECT (01): POPULATION-ORIENTED SURV.         SITE ADDR: LINCOLN CO COURTHOUSE, 418 MINERAL AVE     UTM ZONE: 13
CITY POPULATION:                                STATION TYPE (13): CENTER CITY: COMMERICAL            UTM NORTHING: 5360.4290 M.
AQCR POPULATION:                                AQCR: 144     SMSA: 0000                              UTM EASTING:    607.1330 M.
EPA REGION: [illegible]                         SLAMS/NAMS ID (2): SLAMS                              ELEVATION ABOVE GROUND:  12.0 M.
SUPPORTING AGENCY: MONTANA AIR QUALITY BUREAU                                                         ELEVATION ABOVE MSL:  2,000 FT.
                                                                                                      TIME ZONE: MOUNTAIN
COLLECTION METHOD: HI-VOL                       ANALYSIS METHOD: GRAVIMETRIC

           JANUARY  FEBRUARY     MARCH     APRIL       MAY      JUNE      JULY    AUGUST SEPTEMBER   OCTOBER  NOVEMBER  DECEMBER

      1     74 T    9999 F    9999 F     196 M     109 W    9999 S    9999 M    9999 T    9999 S    9999 T    9999 F    9999 S
      2   9999 W    9999 S     478+S    9999 T    9999 T    9999 S    9999 T    9999 F    9999 M    9999 W    9999 S    9999 M
 D    3   9999 T    9999 S    9999 S    9999 W    9999 F    9999 M    9999 W    9999 S    9999 T    9999 T      79 S    9999 T
      4   9999 F    9999 M    9999 M    9999 T    9999 S    9999 T    9999 T    9999 S     110 W     114 F    9999 M    9999 W
 A    5   9999 S    9999 T    9999 T    9999 F    9999 S    9999 W    9999 F      41 M    9999 T    9999 S    9999 T    9999 T
      6   9999 S      75 W    9999 W    9999 S    9999 M      50 T      62 S    9999 T    9999 F    9999 S    9999 W    9999 F
 Y    7     57 M    9999 T    9999 T    9999 S     126 T    9999 F    9999 S    9999 W    9999 S    9999 M    9999 T    9999 S
      8   9999 T    9999 F     642*F    9999 M    9999 W    9999 S    9999 M    9999 T    9999 S    9999 T    9999 F    9999 S
      9   9999 W    9999 S    9999 S    9999 T    9999 T    9999 S    9999 T    9999 F    9999 M    9999 W      46 S     112 M
     10   9999 T    9999 S    9999 S    9999 W    9999 F    9999 M    9999 W    9999 S      90 T     114 T    9999 S    9999 T
 O   11   9999 F    9999 M    9999 M    9999 T    9999 S    9999 T    9999 T      26 S    9999 W    9999 F    9999 M    9999 W
     12   9999 S      93 T    9999 T    9999 F    9999 S     113 W     156 F    9999 M    9999 T    9999 S    9999 T    9999 T
 F   13     90 S    9999 W    9999 W     120 S     123 M    9999 T    9999 S    9999 T    9999 F    9999 S    9999 W    9999 F
     14   9999 M    9999 T     392*T    9999 S    9999 T    9999 F    9999 S    9999 W    9999 S    9999 M    9999 T    9999 S
     15   9999 T    9999 F    9999 F    9999 M    9999 W    9999 S    9999 M    9999 T    9999 S    9999 T     162 F     165 S
     16   9999 W    9999 S    9999 S    9999 T    9999 T    9999 S    9999 T    9999 F    9999 M      84 W    9999 S    9999 M
 M   17   9999 T    9999 S    9999 S    9999 W    9999 F    9999 M    9999 W      94 S    9999 T    9999 T    9999 S    9999 T
     18   9999 F     139 M    9999 M    9999 T    9999 S     112 T      62 T    9999 S    9999 W    9999 F    9999 M    9999 W
 O   19    183 S    9999 T    9999 T    9999 F     104 S    9999 W    9999 F    9999 M    9999 T    9999 S    9999 T    9999 T
     20   9999 S    9999 W    9999 W    9999 S    9999 M    9999 T    9999 S    9999 T    9999 F    9999 S    9999 W    9999 F
 N   21   9999 M    9999 T    9999 T    9999 S    9999 T    9999 F    9999 S    9999 W    9999 S    9999 M      42 T      92 S
     22   9999 T    9999 F    9999 F    9999 M    9999 W    9999 S    9999 M    9999 T      54 S      51 T    9999 F    9999 S
 T   23   9999 W    9999 S    9999 S    9999 T    9999 T    9999 S    9999 T     230 F    9999 M    9999 W    9999 S    9999 M
     24   9999 T     125 S    9999 S    9999 W    9999 F      67 M      47 W    9999 S    9999 T    9999 T    9999 S    9999 T
 H   25    131 F         M    9999 M     102 T      58 S    9999 T    9999 T    9999 S    9999 W    9999 F    9999 M    9999 W
     26   9999 S         T     167 T         F    9999 S    9999 W    9999 F    9999 M    9999 T    9999 S    9999 T    9999 T
     27   9999 S         W         W         S    9999 M    9999 T    9999 S    9999 T    9999 F    9999 S      53 W     136 F
     28   9999 M         T         T         S    9999 T    9999 F    9999 S    9999 W      77 S      65 M         T         S
     29   9999 T                   F         M    9999 W    9999 S    9999 M     169 T         S         T         F         S
     30   9999 W                   S         T    9999 T      75 S      95 T         F         M         W         S         M
     31    178 T                   S                65 F                   W         S                   T                   T

      N      6         4         4         3         6         5         5         5         4         5         5         4
    MAX    183       139       642       196       126       113       155       230       110       114       162       165
GEO MEAN   106       105       362       137        93        90        77        83        90        82        67       123

TOTAL SAMPLES =    56                         MAXIMUM =         642
GEOMETRIC MEAN =         100                  TOTAL PRIMARY EXCEEDANCES =      3
GEOMETRIC STANDARD DEVIATION =    1.83        TOTAL SECONDARY EXCEEDANCES =     12
      *** MEAN EXCEEDS PRIMARY STANDARD AND EXCEEDS SECONDARY STANDARD OF      75 AND       60 MICROGRAMS PER CUBIC METER, RESPECTIVELY

* INDICATES ITEM EXCEEDED PRIMARY   STANDARD OF     260 MICROGRAMS PER CUBIC METER
+ INDICATES ITEM EXCEEDED SECONDARY STANDARD OF     150 MICROGRAMS PER CUBIC METER
```

Figure AP-10-H

```
                                      AIRS-II STANDARDS REPORT FROM JAN 1985 TO DEC 1985                                      PAGE   122
                                                                 L E A D
REPORT DATE:  JUN 24, 1986                                    DAILY VALUES                               STATE (27): MONTANA

SITE CODE: 27-0[illegible]-002                    LOCATION: EAST HELENA                                  LATITUDE:    N46 D. 35 M. 17 S.
AGENCY (S): STATE                                 COUNTY ([illegible]): LEWIS & CLARK                    LONGITUDE: W111 D. 54 M. 58 S.
PROJECT (02): SOURCE-ORIENTED AMBIENT SURV.       SITE ADDR: HASTIE RESIDENCE - 212 PACIFIC ST           UTM ZONE: 12
CITY POPULATION:                                  STATION TYPE (21): SUBURBAN: INDUSTRIAL                UTM NORTHING: 5159.5770 M.
AQCR POPULATION:                                  AQCR: 142      SMSA: 0000                              UTM EASTING:   429.8160 M.
EPA REGION: 8                                     SLAMS/NAMS ID (2): SLAMS                               ELEVATION ABOVE GROUND:    3.0 M.
SUPPORTING AGENCY: MONTANA AIR QUALITY BUREAU                                                            ELEVATION ABOVE MSL:  3,900 FT.
                                                                                                         TIME ZONE: MOUNTAIN
COLLECTION METHOD: HI-VOL                         ANALYSIS METHOD: EMISSION SPECTRA ICAP

            JANUARY   FEBRUARY      MARCH       APRIL         MAY        JUNE        JULY      AUGUST  SEPTEMBER     OCTOBER    NOVEMBER    DECEMBER

        1    3.450 T 999.900$F  999.900$F    0.640 M     1.710 W  999.900$S  999.900$M  999.900$T    0.320 S     1.930 T  999.900$F  999.900$S
        2  999.900$W 999.900$S    2.080 S  999.900$T   999.900$T  999.900$S  999.900$T    0.770 F  999.900$M   999.900$W  999.900$S  999.900$M
  D     3  999.900$T   2.460 S  999.900$S  999.900$W   999.900$F    0.300 M    2.020 W  999.900$S  999.900$T   999.900$T    3.410 S    0.530 T
        4    6.040 F 999.900$M  999.900$M    0.270 T     1.100 S  999.900$T  999.900$T  999.900$S    0.590 W     2.010 F  999.900$M  999.900$W
  A     5  999.900$S 999.900$T    2.630 T  999.900$F   999.900$S  999.900$W  999.900$F    0.430 M  999.900$T   999.900$S  999.900$T  999.900$T
        6  999.900$S   1.410 W  999.900$W  999.900$S   999.900$M    1.230 T    0.210 S  999.900$T  999.900$F   999.900$S    0.560 W    1.150 F
  Y     7    3.210 M 999.900$T  999.900$T    2.510 S     5.520 T  999.900$F  999.900$S  999.900$W    0.000 S     0.270 M  999.900$T  999.900$S
        8  999.900$T 999.900$F  999.900$F  999.900$M   999.900$W  999.900$S  999.900$M    1.270 T  999.900$S   999.900$T  999.900$F  999.900$S
        9  999.900$W   2.640 S  999.900$S  999.900$T   999.900$T  999.900$S  999.900$T  999.900$F  999.900$M   999.900$W    0.300 S    1.310 M
       10    1.270 T 999.900$S  999.900$S    3.020 W     1.190 F  999.900$M  999.900$W  999.900$S  999.900$T     2.190 T  999.900$S  999.900$T
  O    11  999.900$F 999.900$M    1.150 M  999.900$T   999.900$S  999.900$T  999.900$T  999.900$S  999.900$W   999.900$F  999.900$M  999.900$W
       12  999.900$S   3.290 T  999.900$T  999.900$F   999.900$S  999.900$W    6.540 F  999.900$M  999.900$T   999.900$S  999.900$T    0.250 T
  F    13    2.270 S 999.900$W  999.900$W    5.680 S     2.100 M  999.900$T  999.900$S  999.900$T  999.900$F   999.900$S  999.900$W  999.900$F
       14  999.900$M 999.900$T  999.900$T  999.900$S   999.900$T  999.900$F  999.900$S    1.730 W  999.900$S   999.900$M  999.900$T  999.900$S
       15  999.900$T 999.900$F  999.900$F  999.900$M   999.900$W    0.680 S    1.540 M  999.900$T  999.900$S   999.900$T    2.840 F    1.040 S
       16    2.570 W 999.900$S  999.900$S    1.730 T     1.330 T  999.900$S  999.900$T  999.900$F    1.650 M     2.370 W  999.900$S  999.900$M
  M    17  999.900$T 999.900$S    2.740 S  999.900$W   999.900$F  999.900$M  999.900$W    0.080 S  999.900$T   999.900$T  999.900$S  999.900$T
       18  999.900$F   4.110 M  999.900$M  999.900$T   999.900$S    3.420 T    0.780 T  999.900$S  999.900$W   999.900$F    0.190 M    2.220 W
  O    19    0.400 S 999.900$T  999.900$T    0.330 F     6.720 S  999.900$W  999.900$F  999.900$M    3.100 T     4.270 S  999.900$T  999.900$T
       20  999.900$S 999.900$W    2.210 W  999.900$S   999.900$M  999.900$T  999.900$S    0.620 T  999.900$F   999.900$S  999.900$W  999.900$F
  N    21  999.900$M   0.760 T  999.900$T  999.900$S   999.900$T    1.160 F    1.130 S  999.900$W  999.900$S   999.900$M    0.390 T    2.370 S
       22    2.950 T 999.900$F  999.900$F    2.860 M     2.080 W  999.900$S  999.900$M  999.900$T  999.900$S     5.040 T  999.900$F  999.900$S
  T    23  999.900$W 999.900$S    2.540 S  999.900$T   999.900$T  999.900$S  999.900$T    4.040 F  999.900$M   999.900$W  999.900$S  999.900$M
       24  999.900$T   1.270 S  999.900$S  999.900$W   999.900$F    0.300 M    0.820 W  999.900$S  999.900$T   999.900$T    0.430 S    1.780 T
  H    25    4.770 F 999.900$M  999.900$M    0.630 T     2.020 S  999.900$T  999.900$T  999.900$S    3.140 W     7.640 F  999.900$M  999.900$W
       26  999.900$S 999.900$T    1.220 T  999.900$F   999.900$S  999.900$W  999.900$F    2.310 M  999.900$T   999.900$S  999.900$T  999.900$T
       27  999.900$S   1.340 W  999.900$W  999.900$S   999.900$M    2.410 T    0.180 S  999.900$T  999.900$F   999.900$S    0.410 W    2.020 F
       28  999.900$M         T  999.900$T    2.590 S     0.570 T  999.900$F  999.900$S  999.900$W    0.430 S     1.590 M  999.900$T  999.900$S
       29  999.900$T              1.650 F          M   999.900$W  999.900$S  999.900$M    1.320 T          S  999.900$T  999.900$F  999.900$S
       30  999.900$W                    S          T   999.900$T    3.180 S    0.620 T          F          M  999.900$W    0.390 S    1.740 M
       31    1.920 T                    S                0.340 F                      W          S              0.290 T                      T

         N                             26                              29                                  25                                  29
       MAX                          6.040                           6.720                               6.540                               7.640
ARITH MEAN                          2.314                           1.997                               1.420                               1.756

TOTAL SAMPLES =  109                  MAXIMUM =       7.640
                                      TOTAL PRIMARY EXCEEDANCES =     3

     *** AT LEAST ONE QUARTERLY MEAN EXCEEDS PRIMARY STANDARD OF  1.500 MICROGRAMS PER CUBIC METER

$ INDICATES ITEM HAS TO BE MULTIPLIED BY 10 TO OBTAIN THE CORRECT VALUE.  EXAMPLE: AN ITEM PRINTED AS 24.3$ WOULD = 243.0
```

Figure AP-11-H

# APPENDIX I

## Air Quality Data Plots

# APPENDIX I

## AIR QUALITY DATA PLOTS

This appendix shows a sampling of plots and histograms that can be generated using air quality data.

The list is as follows:

### TSP - One Year Plots

| | |
|---|---|
| AP-1-I | Billings - City Hall - 1985 |
| AP-2-I | Great Falls - Fire Station #1 - 1985 |
| AP-3-I | Montana City - Montana City School - 1985 |
| AP-4-I | Libby - Lincoln County Courthouse - 1985 |
| AP-5-I | Eureka - Lincoln Electric - Co-op - 1985 |

### TSP - Three Year Plots

| | |
|---|---|
| AP-6-I | Thompson Falls - Sanders County Courthouse - 1983-85 |
| AP-7-I | Missoula - Boyd Park - 1983-85 |
| AP-8-I | Columbia Falls - Anders Residence - 1983-85 |

### Carbon Monoxide - Diurnal

| | |
|---|---|
| AP-9-I | Missoula - Boyd Park - December 1985 |
| AP-10-I | Great Falls - Pardis Clinic - January 1985 |

### Sulfur Dioxide - Diurnal

| | |
|---|---|
| AP-11-I | Billings - North Johnson Lane - July 1985 |
| AP-12-I | Billings - Coburn Road - January 1985 |

### Lead - One Year Plots

| | |
|---|---|
| AP-13-I | East Helena - Firehall - 1985 |
| AP-14-I | East Helena - Hadfield - 1985 |

### Lead - Three Year Plots

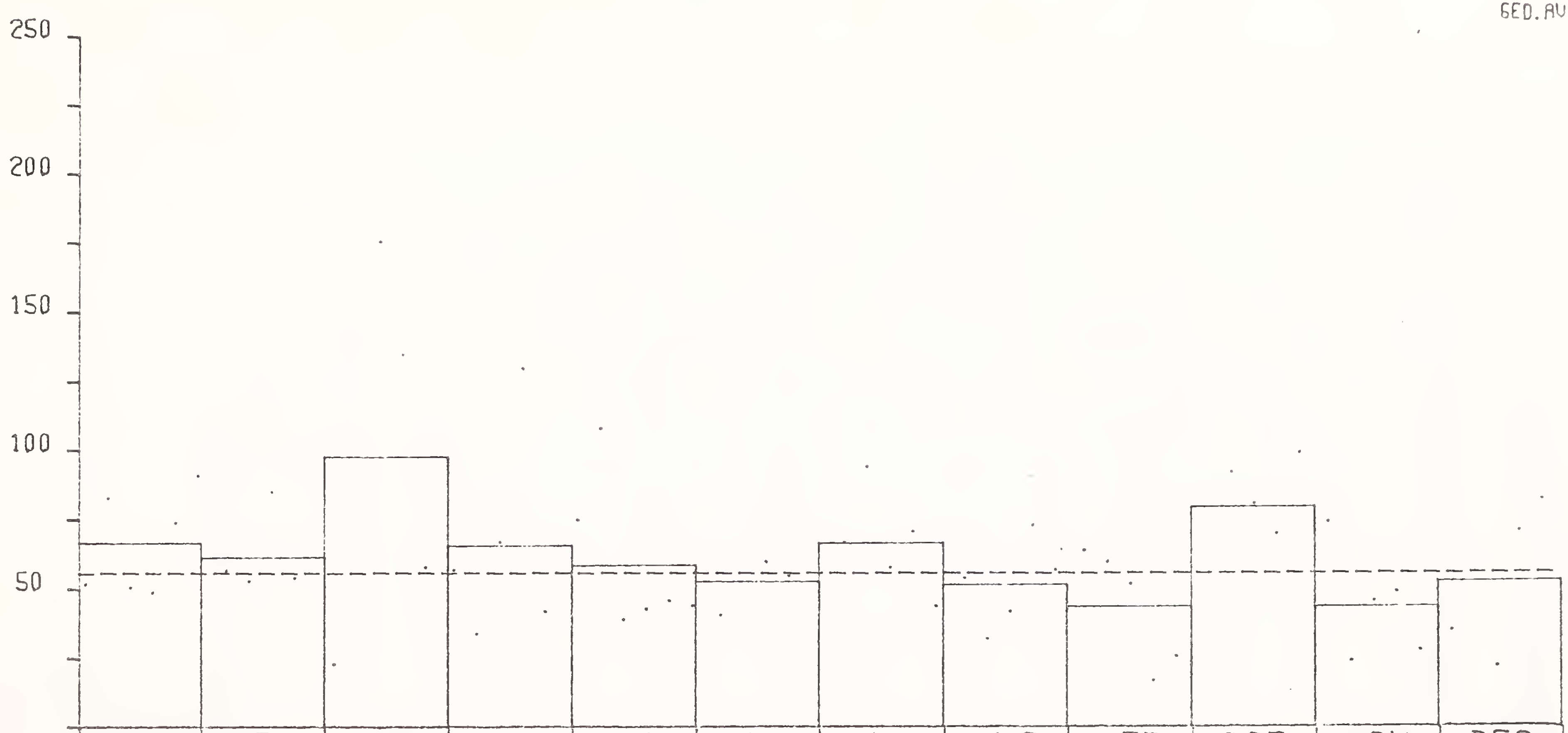
| | |
|---|---|
| AP-15-I | East Helena - Hastie Residence - 1983-85 |
| AP-16-I | East Helena - Firehall - 1983-85 |

### Beta (Light) Scatter - Diurnal

| | |
|---|---|
| AP-17-I | Libby - River Site - October 1985 |

Figure AP-1-I

1985
GEO.AVG = 56



|  | JAN | FEB | MAR | APR | MAY | JUN | JUL | AUG | SEP | OCT | NOV | DEC |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| NUM-OBS | 6 | 4 | 4 | 5 | 6 | 4 | 5 | 5 | 5 | 5 | 5 | 5 |
| 1-HIGH | 91 | 85 | 176 | 130 | 108 | 60 | 94 | 73 | 64 | 99 | 74 | 82 |
| 2-HIGH | 83 | 57 | 135 | 67 | 75 | 56 | 71 | 57 | 60 | 92 | 49 | 71 |
| MO.AVG | 67 | 62 | 98 | 66 | 59 | 53 | 67 | 52 | 44 | 80 | 44 | 53 |

PLOT. . . . . . . CONCENTRATION VERSUS TIME
METHOD . . . . . HI VOL
UNITS . . . . . . MICROGRAMS/CUBIC METER
STANDARDS . . . (FEDERAL) ANNUAL - 75 UG/CU.M

PARAMETER . . TOTAL SUSPENDED PARTICULATES
AREA. . . . . . . 0080, YELLOWSTONE COUNTY
SITE. . . . . . . 008, CITY HALL
CITY. . . . . . . BILLINGS

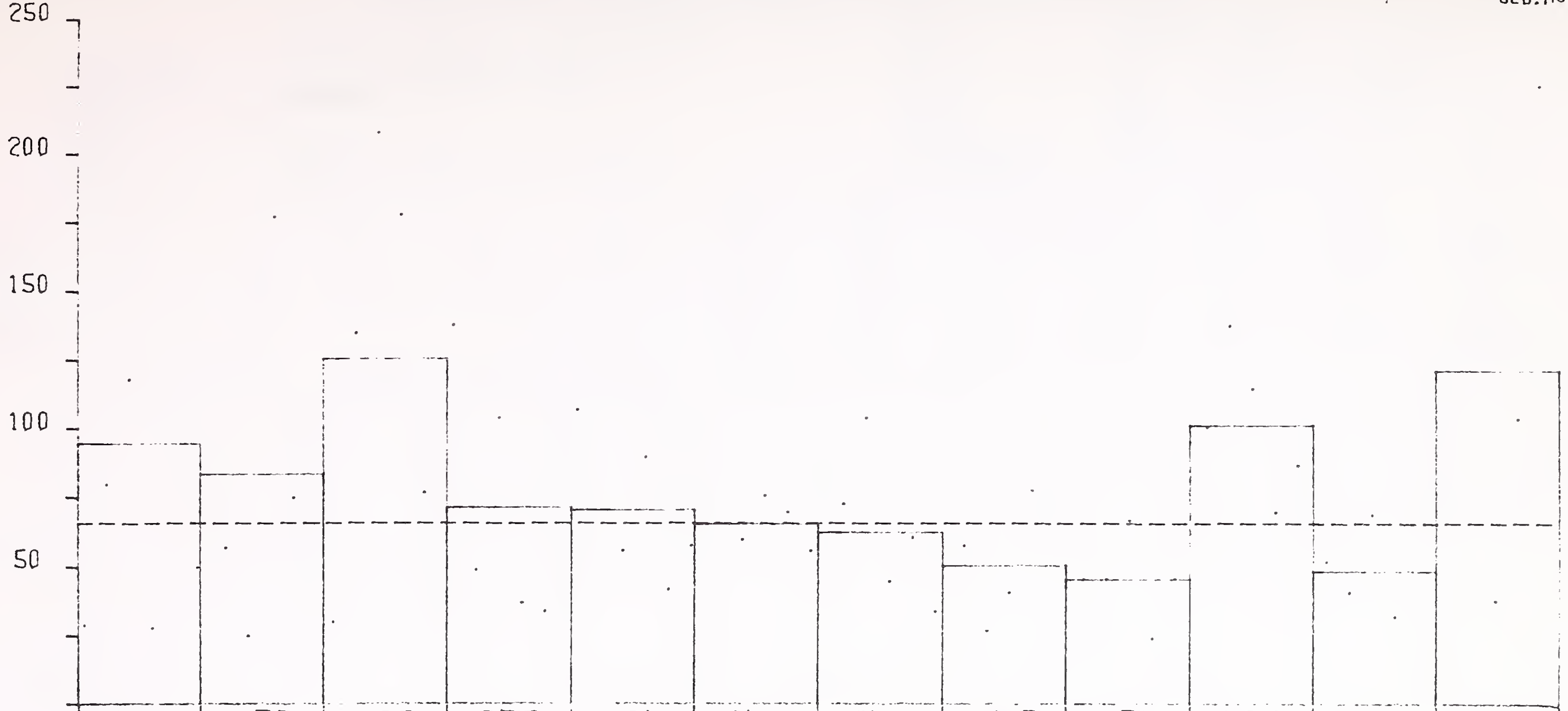
MONTANA STATE AIR QUALITY BUREAU

JULY 17, 1986

TECHNICAL SERVICES

Figure AP-2-I

1985
GEO.AVG = 66



| | JAN | FEB | MAR | APR | MAY | JUN | JUL | AUG | SEP | OCT | NOV | DEC |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| NUM-OBS | 6 | 4 | 5 | 5 | 5 | 4 | 5 | 4 | 5 | 5 | 4 | 3 |
| 1-HIGH | 264 | 177 | 208 | 138 | 107 | 76 | 104 | 78 | 67 | 138 | 69 | 225 |
| 2-HIGH | 118 | 75 | 178 | 104 | 90 | 70 | 73 | 58 | 46 | 115 | 52 | 104 |
| MO.AVG | 95 | 84 | 126 | 72 | 71 | 66 | 63 | 51 | 46 | 102 | 49 | 122 |

PLOT. . . . . . . CONCENTRATION VERSUS TIME
METHOD . . . . . HI VOL
UNITS . . . . . . MICROGRAMS/CUBIC METER
STANDARDS . . . (FEDERAL) ANNUAL - 75 UG/CU.M

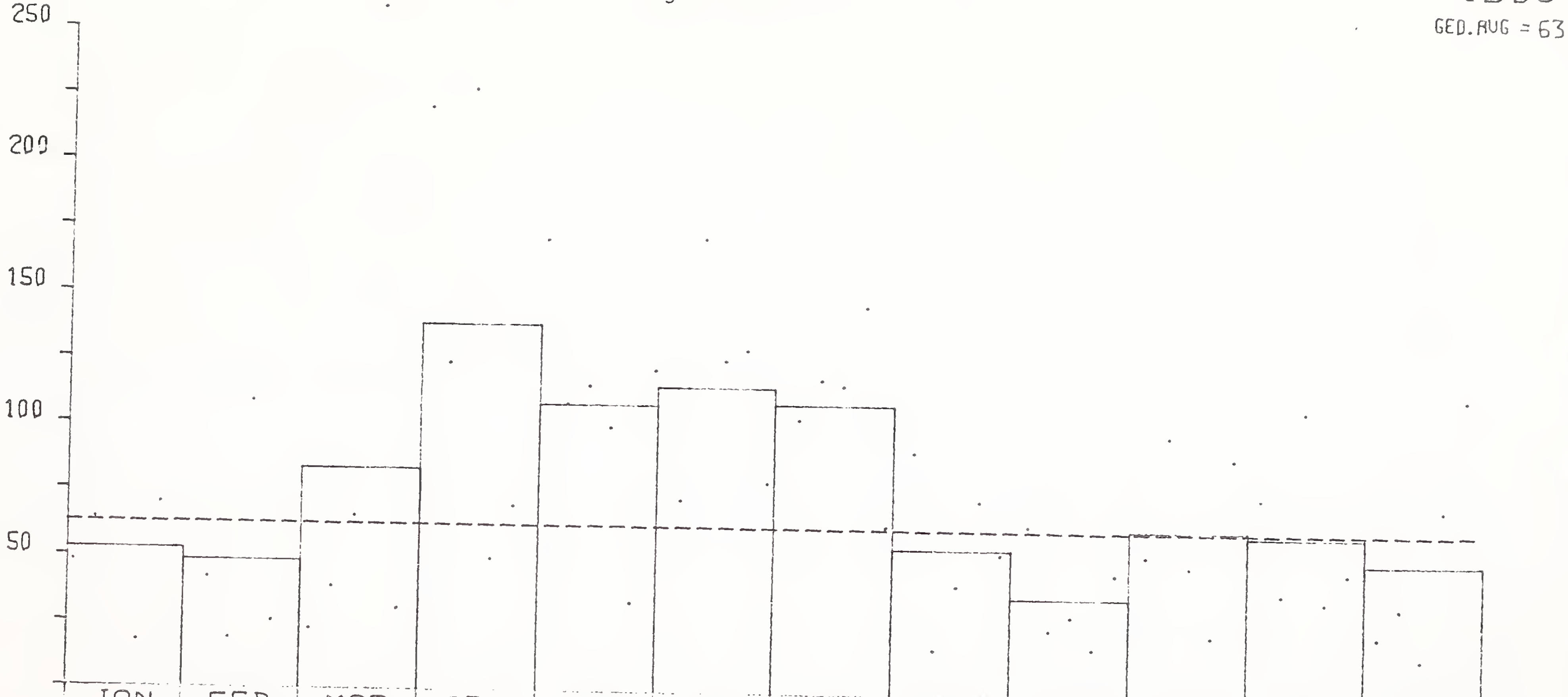
PARAMETER . . TOTAL SUSPENDED PARTICULATES
AREA. . . . . . 0660, CASCADE COUNTY
SITE. . . . . . 009, FIRE STATION #1
CITY. . . . . . GREAT FALLS

MONTANA STATE AIR QUALITY BUREAU

JULY 17, 1985

TECHNICAL SERVICES

Figure AP-3-I



| | JAN | FEB | MAR | APR | MAY | JUN | JUL | AUG | SEP | OCT | NOV | DEC |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| NUM-OBS | 5 | 4 | 5 | 5 | 6 | 5 | 5 | 5 | 5 | 5 | 5 | 5 |
| 1-HIGH | 70 | 109 | 259 | 228 | 171 | 172 | 147 | 92 | 65 | 99 | 109 | 114 |
| 2-HIGH | 64 | 42 | 66 | 221 | 122 | 130 | 119 | 74 | 47 | 91 | 76 | 72 |
| MO.AVG | 53 | 49 | 84 | 139 | 109 | 116 | 110 | 56 | 38 | 64 | 62 | 52 |

PLOT. . . . . . . CONCENTRATION VERSUS TIME
METHOD . . . . . HI VOL
UNITS . . . . . . MICROGRAMS/CUBIC METER
STANDARDS . . . (FEDERAL) ANNUAL - 75 UG/CU.M

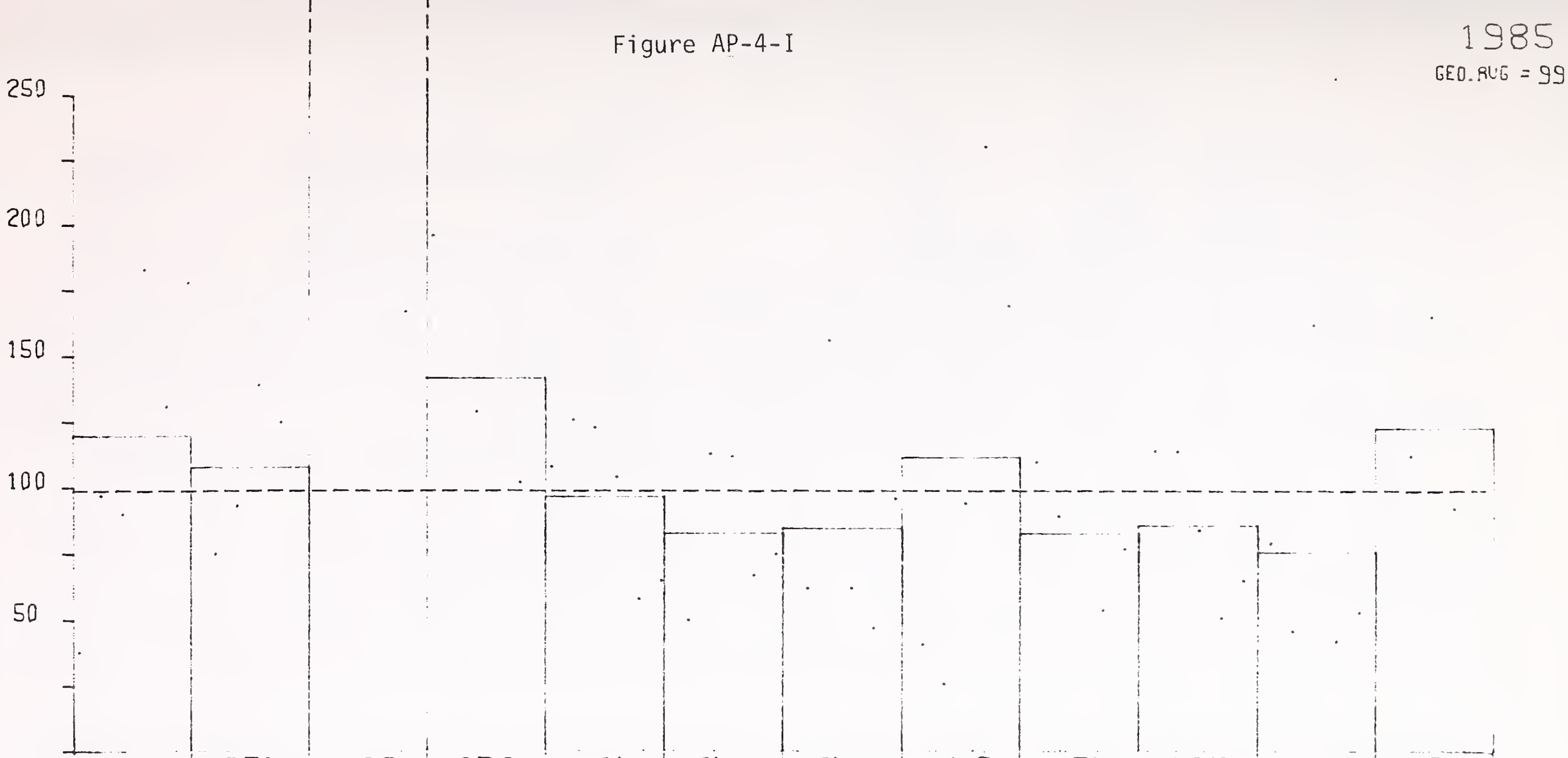
PARAMETER . . TOTAL SUSPENDED PARTICULATES
AREA. . . . . . 0760, JEFFERSON COUNTY
SITE. . . . . . 905, MONTANA CITY SCHOOL
CITY. . . . . . MONTANA CITY

MONTANA STATE AIR QUALITY BUREAU

JULY 17, 1986

TECHNICAL SERVICES

Figure AP-4-I



| | JAN | FEB | MAR | APR | MAY | JUN | JUL | AUG | SEP | OCT | NOV | DEC |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| NUM-OBS | 6 | 4 | 4 | 3 | 6 | 5 | 5 | 5 | 4 | 5 | 5 | 3 |
| 1-HIGH | 183 | 139 | 642 | 196 | 126 | 113 | 156 | 230 | 110 | 114 | 162 | 165 |
| 2-HIGH | 178 | 125 | 438 | 129 | 123 | 112 | 96 | 169 | 89 | 114 | 79 | 112 |
| MO.AVG | 120 | 108 | 410 | 142 | 97 | 83 | 85 | 112 | 83 | 86 | 76 | 123 |

PLOT. . . . . . . CONCENTRATION VERSUS TIME
METHOD . . . . . HI VOL
UNITS . . . . . . MICROGRAMS/CUBIC METER
STANDARDS . . . (FEDERAL) ANNUAL - 75 UG/CU.M

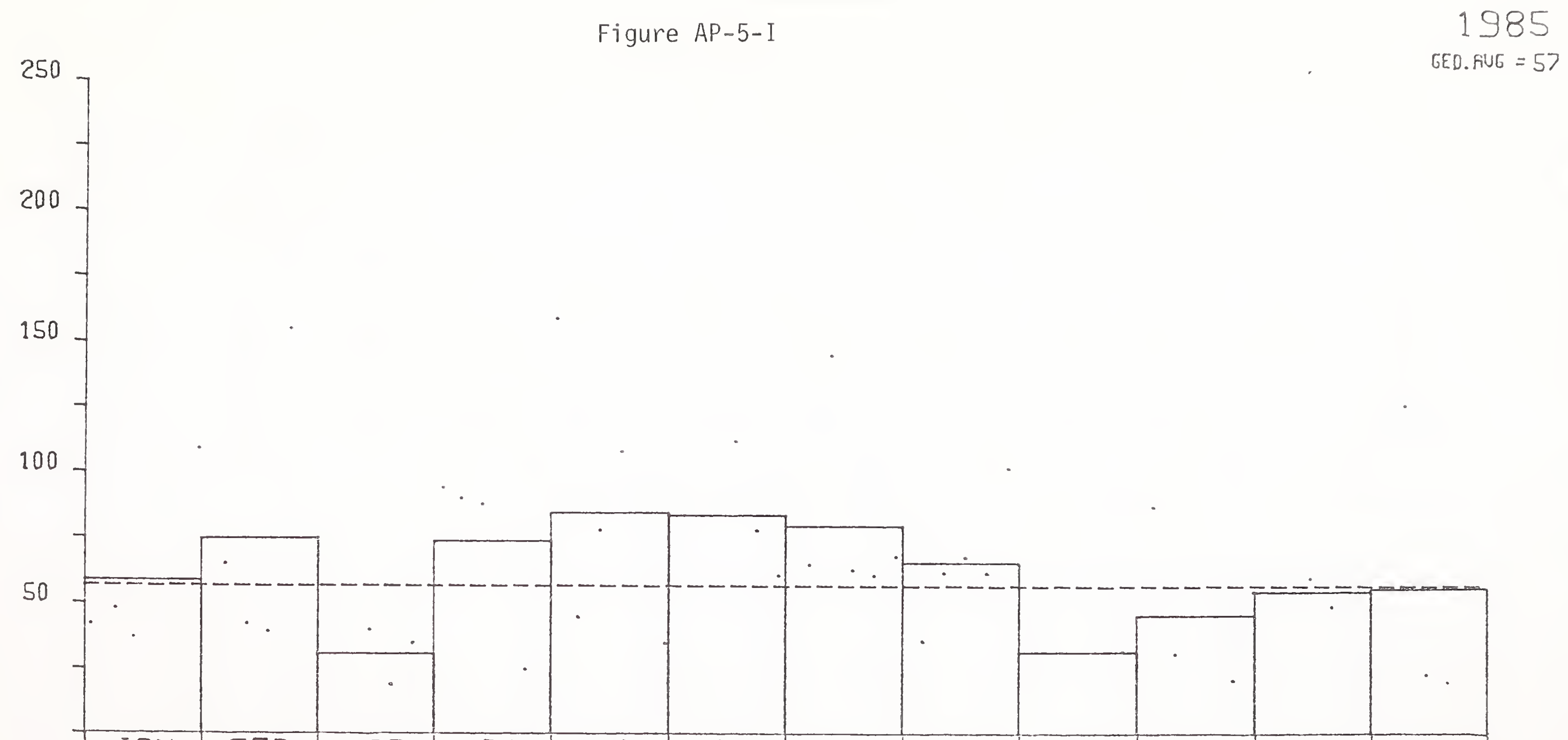
PARAMETER . . TOTAL SUSPENDED PARTICULATES
AREA. . . . . . 0900, LINCOLN COUNTY
SITE. . . . . . 012, COUNTY COURTHOUSE
CITY. . . . . . LIBBY

MONTANA STATE AIR QUALITY BUREAU

JULY 17, 1986

TECHNICAL SERVICES

Figure AP-5-I



| | JAN | FEB | MAR | APR | MAY | JUN | JUL | AUG | SEP | OCT | NOV | DEC |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| NUM-OBS | 4 | 4 | 3 | 4 | 5 | 3 | 5 | 5 | 1 | 3 | 2 | 3 |
| 1-HIGH | 109 | 155 | 40 | 94 | 159 | 112 | 145 | 102 | 32 | 87 | 60 | 126 |
| 2-HIGH | 48 | 65 | 35 | 90 | 108 | 78 | 68 | 68 | | 31 | 49 | 23 |
| MO.AVG | 59 | 75 | 31 | 74 | 85 | 84 | 80 | 66 | 32 | 46 | 55 | 56 |

PLOT. . . . . . . CONCENTRATION VERSUS TIME
METHOD . . . . . HI VOL
UNITS . . . . . .MICROGRAMS/CUBIC METER
STANDARDS . . .(FEDERAL) ANNUAL - 75 UG/CU.M

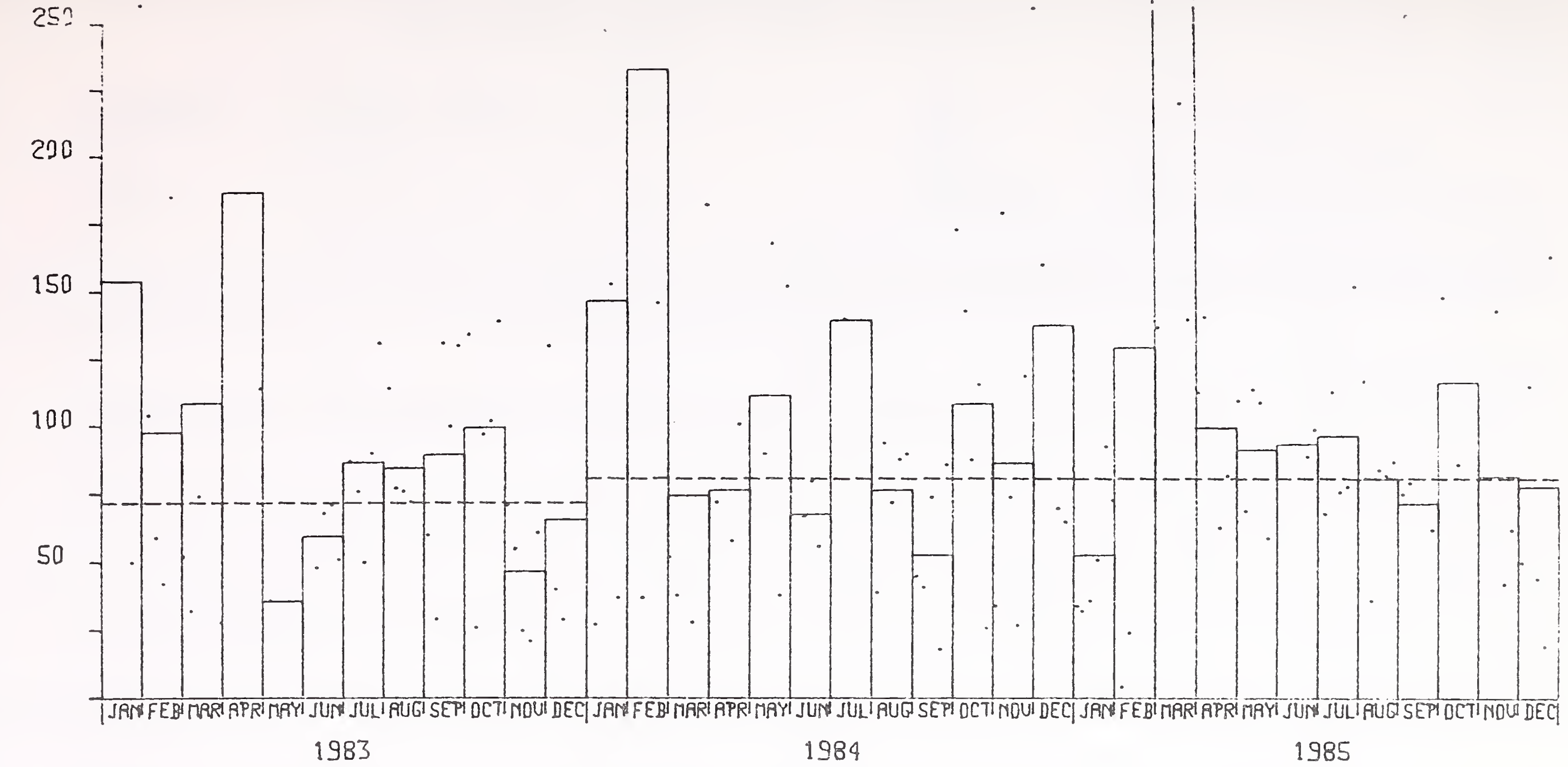
PARAMETER . . TOTAL SUSPENDED PARTICULATES
AREA. . . . . . 0940, LINCOLN COUNTY
SITE. . . . . . 005, LINCOLN ELECTRIC CO-OP
CITY. . . . . . LIBBY

MONTANA STATE AIR QUALITY BUREAU

JULY 15, 1986

TECHNICAL SERVICES

Figure AP-6-I



| | JAN | FEB | MAR | APR | MAY | JUN | JUL | AUG | SEP | OCT | NOV | DEC |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **1983** | | | | | | | | | | | |
| NUM OBS | 2 | 4 | 5 | 2 | 1 | 4 | 5 | 4 | 5 | 5 | 5 | 3 |
| MO.AVG | 154 | 98 | 109 | 187 | 36 | 60 | 87 | 85 | 90 | 100 | 47 | 66 |
| GEO.AVG | 72 | | | | | | | | | | | |
| | **1984** | | | | | | | | | | | |
| NUM OBS | 4 | 4 | 4 | 3 | 4 | 3 | 1 | 5 | 5 | 5 | 5 | 4 |
| MO.AVG | 147 | 233 | 75 | 77 | 112 | 68 | 140 | 77 | 53 | 109 | 87 | 138 |
| GEO.AVG | 81 | | | | | | | | | | | |
| | **1985** | | | | | | | | | | | |
| NUM OBS | 6 | 3 | 5 | 4 | 5 | 2 | 5 | 5 | 3 | 2 | 3 | 5 |
| MO.AVG | 53 | 130 | 293 | 100 | 92 | 94 | 97 | 81 | 72 | 117 | 82 | 78 |
| GEO.AVG | 81 | | | | | | | | | | | |

PLOT. . . . . . . .CONCENTRATION VERSUS TIME

METHOD . . . . . .HI VOL

UNITS . . . . . . .MICROGRAMS/CUBIC METER

STANDARDS . . .(FEDERAL) ANNUAL - 75 UG/CU.M

PARAMETER . . .TOTAL SUSPENDED PARTICULATES

AREA. . . . . . . .1400, SANDERS COUNTY

SITE. . . . . . . .003, COUNTY COURTHOUSE

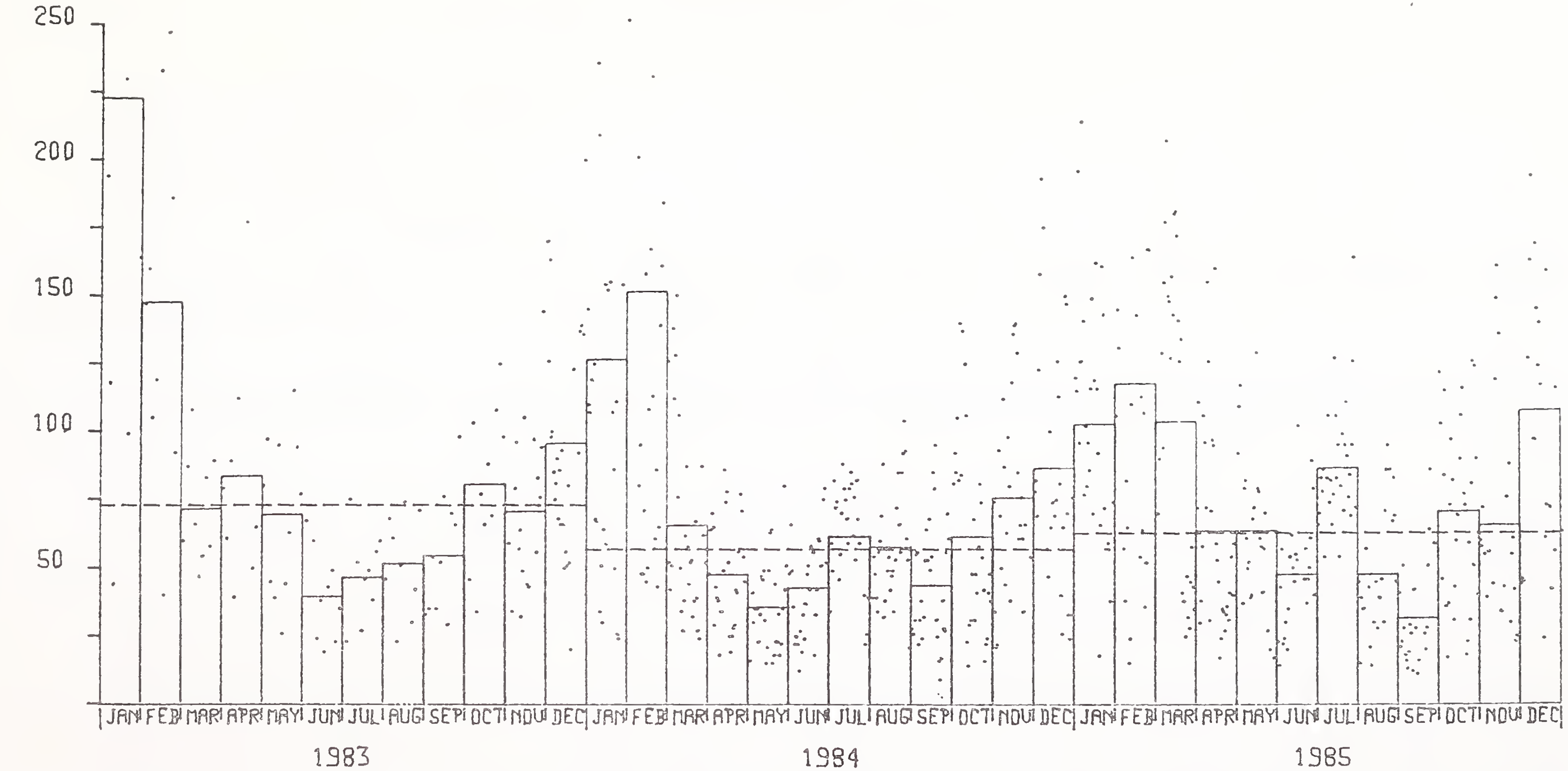
CITY. . . . . . . .THOMPSON FALLS

MONTANA STATE AIR QUALITY BUREAU

JULY 15, 1986

TECHNICAL SERVICES

Figure AP-7-I



| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| NUM OBS | 11 | 9 | 9 | 8 | 11 | 9 | 9 | 9 | 10 | 10 | 18 | 26 | 26 | 28 | 29 | 29 | 28 | 30 | 27 | 30 | 30 | 30 | 27 | 27 | 30 | 23 | 29 | 30 | 24 | 26 | 30 | 24 | 23 | 30 | 23 | 23 |
| MO.AVG | 223 | 148 | 72 | 84 | 70 | 40 | 47 | 52 | 55 | 81 | 71 | 96 | 127 | 152 | 66 | 48 | 36 | 43 | 62 | 58 | 44 | 62 | 76 | 87 | 103 | 118 | 104 | 64 | 64 | 48 | 87 | 48 | 32 | 71 | 66 | 108 |
| GEO.AVG | 73 | | | | | | | | | | | | 57 | | | | | | | | | | | | 63 | | | | | | | | | | | |

PLOT. . . . . . . CONCENTRATION VERSUS TIME
METHOD . . . . . HI VOL
UNITS . . . . . . MICROGRAMS/CUBIC METER
STANDARDS . . . (FEDERAL) ANNUAL - 75 UG/CU.M

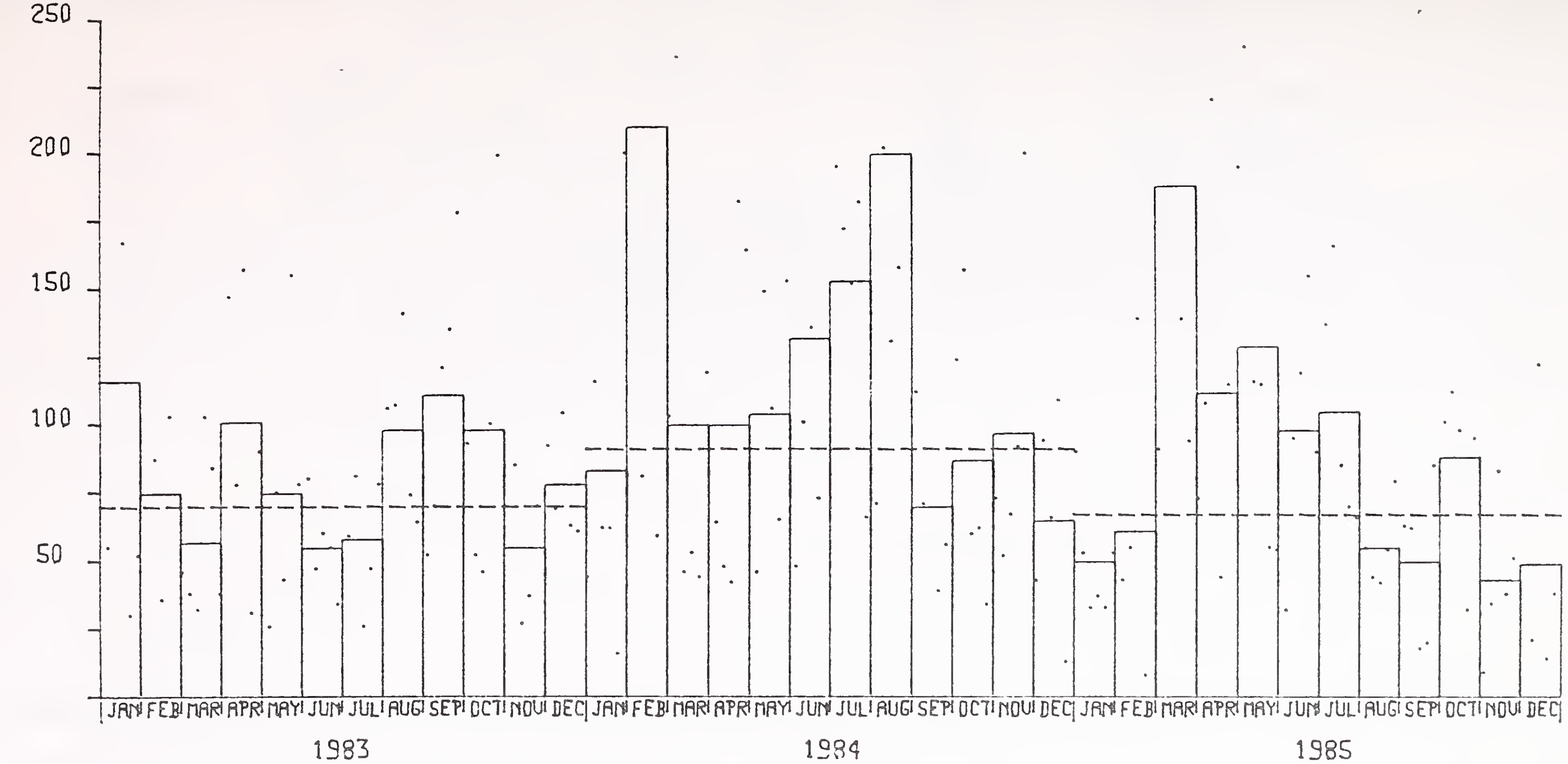
PARAMETER . . TOTAL SUSPENDED PARTICULATES
AREA. . . . . . . 1100, MISSOULA COUNTY
SITE. . . . . . . 024, BOYD PARK
CITY. . . . . . . MISSOULA

MONTANA STATE AIR QUALITY BUREAU

JULY 15, 1986

TECHNICAL SERVICES

Figure AP-8-I



| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| NUM OBS | 5 | 3 | 6 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 4 | 5 | 6 | 4 | 6 | 5 | 5 | 5 | 5 | 5 | 4 | 5 | 5 | 5 | 6 | 4 | 5 | 5 | 6 | 5 | 5 | 5 | 5 | 5 | 5 | 4 |
| MO.AVG | 116 | 75 | 57 | 101 | 75 | 55 | 58 | 98 | 111 | 98 | 55 | 78 | 83 | 210 | 100 | 100 | 104 | 132 | 153 | 200 | 70 | 87 | 97 | 65 | 50 | 61 | 188 | 112 | 129 | 98 | 105 | 55 | 50 | 88 | 43 | 49 |
| GEO.AVG | 70 | | | | | | | | | | | | 91 | | | | | | | | | | | | 67 | | | | | | | | | | | |

PLOT. . . . . . . CONCENTRATION VERSUS TIME
METHOD . . . . . HI VOL
UNITS . . . . . . MICROGRAMS/CUBIC METER
STANDARDS . . . (FEDERAL) ANNUAL - 75 UG/CU.M

PARAMETER . . TOTAL SUSPENDED PARTICULATES
AREA. . . . . . .0270, FLATHEAD COUNTY
SITE. . . . . . .005, ANDERS RESIDENCE
CITY. . . . . . .COLUMBIA FALLS

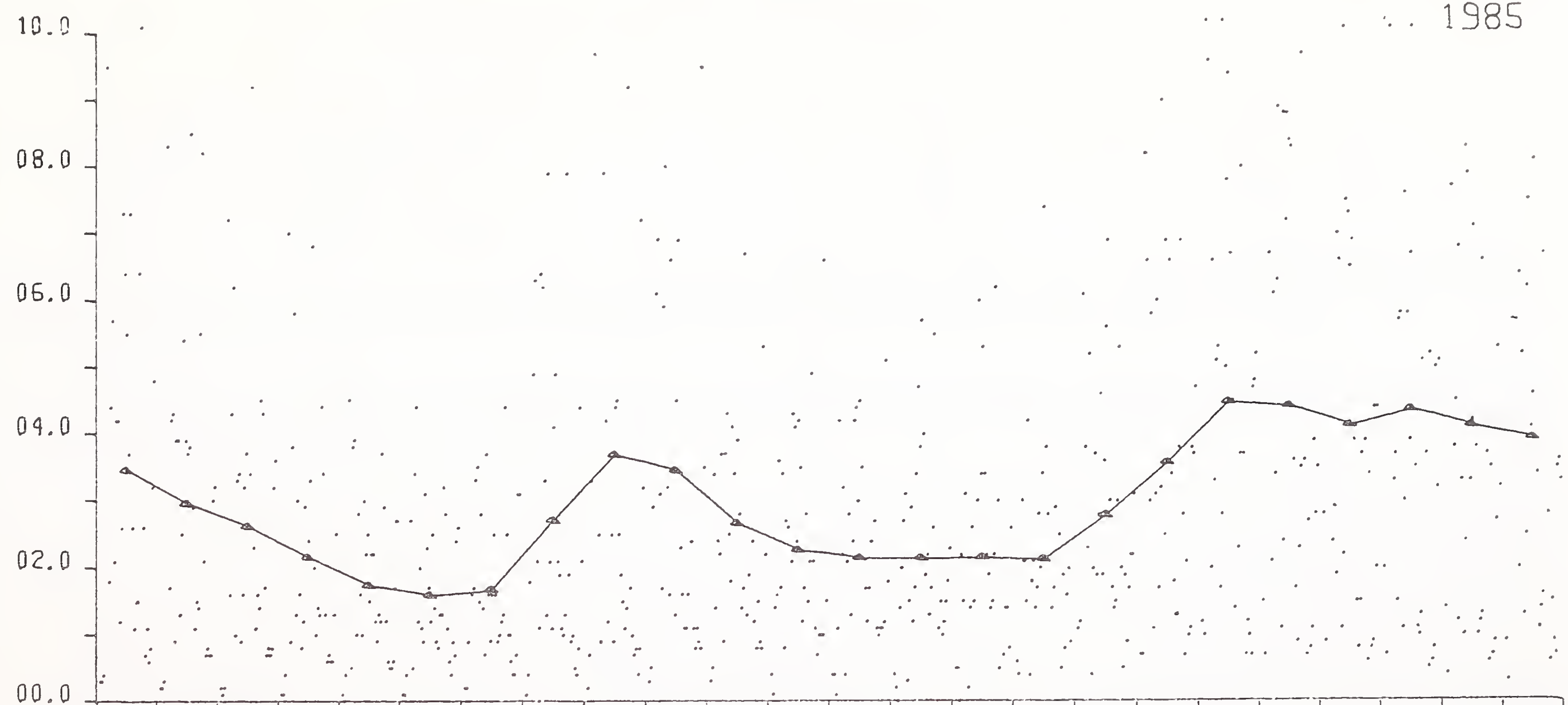
MONTANA STATE AIR QUALITY BUREAU

JULY 15, 1986

TECHNICAL SERVICES

Figure AP-9-I

DECEMBER
1985



| | 00 | 01 | 02 | 03 | 04 | 05 | 06 | 07 | 08 | 09 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| NUM-OBS | 30 | 30 | 30 | 30 | 30 | 30 | 30 | 30 | 30 | 30 | 30 | 30 | 29 | 30 | 28 | 27 | 30 | 29 | 29 | 30 | 29 | 30 | 30 | 29 |
| 1-HIGH | 10.1 | 8.50 | 9.20 | 7.00 | 4.50 | 4.40 | 4.40 | 7.90 | 11.7 | 12.6 | 10.7 | 6.60 | 5.10 | 5.70 | 6.20 | 7.40 | 6.90 | 9.00 | 10.2 | 11.0 | 11.1 | 12.0 | 14.9 | 11.6 |
| 2-HIGH | 9.50 | 8.30 | 7.20 | 6.80 | 3.90 | 3.40 | 3.70 | 7.90 | 11.6 | 9.50 | 6.70 | 4.90 | 4.50 | 5.50 | 6.00 | 4.20 | 6.10 | 8.20 | 10.2 | 9.70 | 10.5 | 11.6 | 10.7 | 10.6 |
| HR.AVG | 3.46 | 2.96 | 2.62 | 2.15 | 1.74 | 1.60 | 1.67 | 2.71 | 3.68 | 3.44 | 2.67 | 2.27 | 2.14 | 2.15 | 2.15 | 2.13 | 2.78 | 3.56 | 4.47 | 4.41 | 4.12 | 4.35 | 4.11 | 3.92 |

PLOT. . . . . . CONCENTRATION VERSUS TIME (MON-SUN)
METHOD . . . . . NON-DISPERSIVE INFARED
UNITS . . . . . . PARTS PER MILLION
STANDARDS . . . (FEDERAL) 9 PPM 8-HR / 35 PPM 1-HR

PARAMETER . . CARBON MONOXIDE
AREA. . . . . . 1100, MISSOULA COUNTY
SITE. . . . . . 024, BOYD PARK
CITY. . . . . . MISSOULA

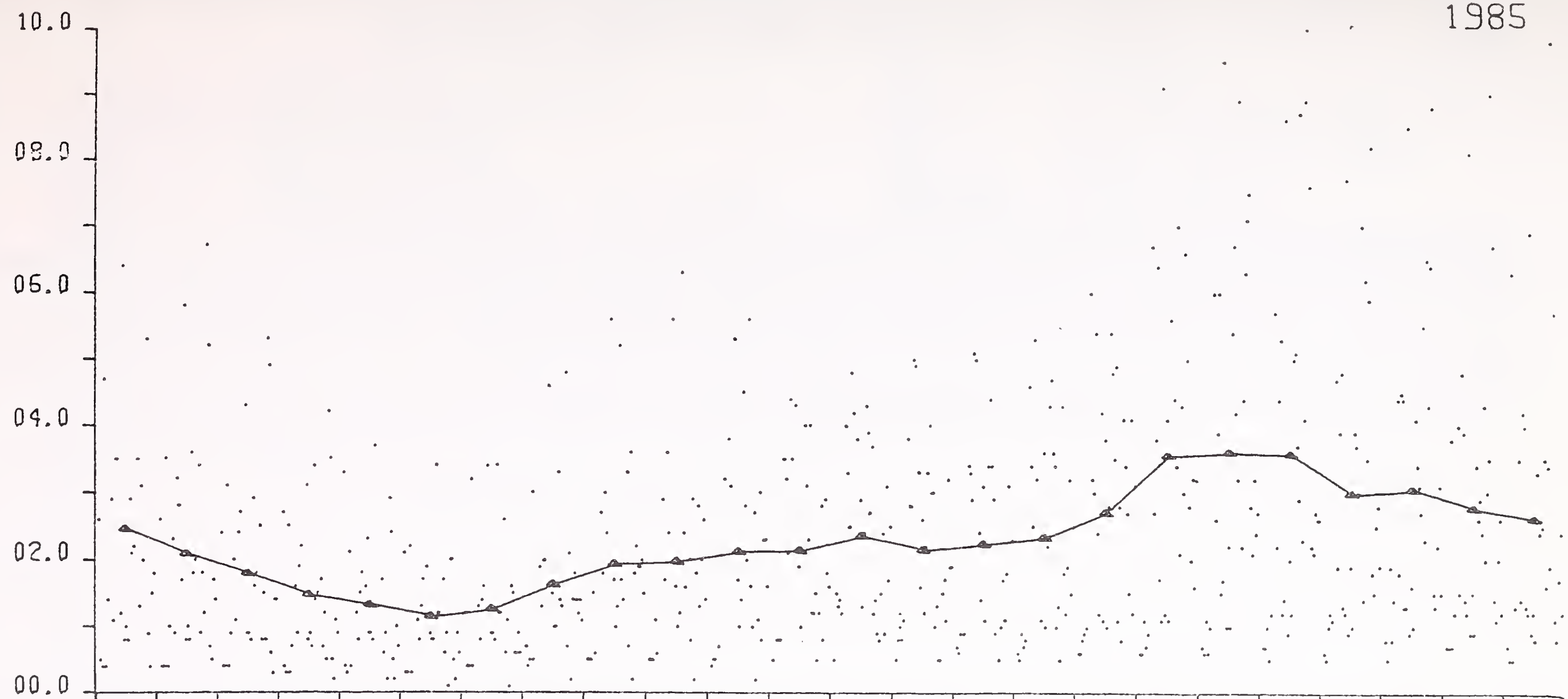
MONTANA STATE AIR QUALITY BUREAU

AUGUST 1, 1985

TECHNICAL SERVICES

Figure AP-10-I

JANUARY
1985



| | 00 | 01 | 02 | 03 | 04 | 05 | 06 | 07 | 08 | 09 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| NUM-OBS | 28 | 28 | 28 | 28 | 27 | 26 | 26 | 26 | 26 | 26 | 25 | 26 | 28 | 29 | 27 | 29 | 30 | 30 | 30 | 30 | 30 | 30 | 30 | 30 |
| 1-HIGH | 10.7 | 6.70 | 5.30 | 4.20 | 3.70 | 3.40 | 3.40 | 4.80 | 5.60 | 6.30 | 5.60 | 4.40 | 4.80 | 5.00 | 5.10 | 5.30 | 6.00 | 10.8 | 9.50 | 10.0 | 8.20 | 8.80 | 9.00 | 9.80 |
| 2-HIGH | 6.40 | 5.80 | 4.90 | 3.50 | 3.30 | 2.20 | 3.40 | 4.60 | 5.20 | 5.60 | 5.30 | 4.30 | 4.30 | 4.90 | 5.00 | 4.70 | 5.40 | 9.10 | 8.90 | 8.90 | 7.70 | 8.50 | 8.10 | 6.90 |
| HR.AVG | 2.46 | 2.08 | 1.79 | 1.47 | 1.32 | 1.14 | 1.25 | 1.63 | 1.94 | 1.97 | 2.12 | 2.14 | 2.36 | 2.14 | 2.23 | 2.34 | 2.71 | 3.56 | 3.61 | 3.58 | 3.00 | 3.06 | 2.78 | 2.62 |

PLOT. . . . . . . CONCENTRATION VERSUS TIME (MON-SUN)
METHOD . . . . . NON-DISPERSIVE INFARED
UNITS . . . . . . PARTS PER MILLION
STANDARDS . . . (FEDERAL) 9 PPM 8-HR / 35 PPM 1-HR

PARAMETER . . CARBON MONOXIDE
AREA. . . . . . 0660, CASCADE COUNTY
SITE. . . . . . 023, PARDIS CLINIC
CITY. . . . . . GREAT FALLS

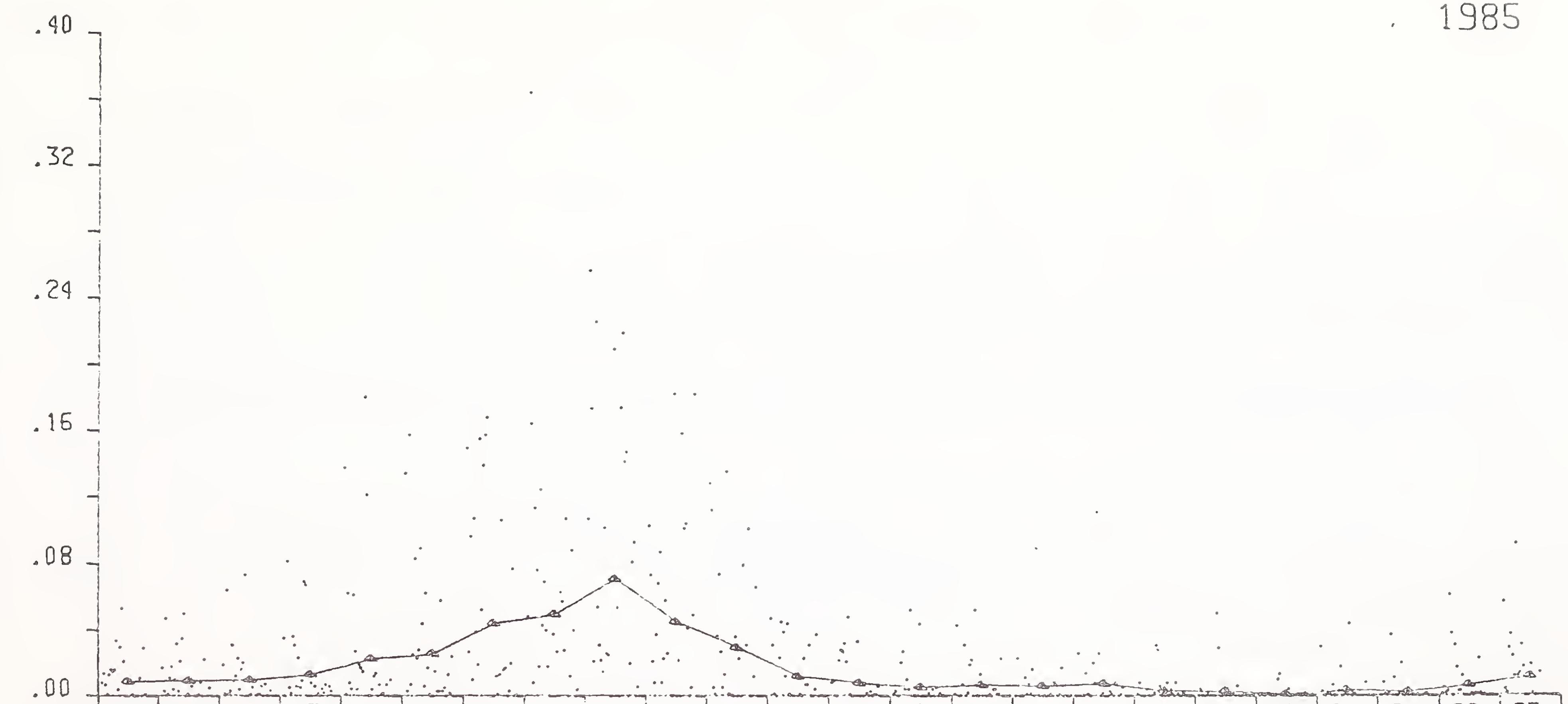
MONTANA STATE AIR QUALITY BUREAU

AUGUST 1, 1986

TECHNICAL SERVICES

Figure AP-11-I

JULY
1985



| | 00 | 01 | 02 | 03 | 04 | 05 | 06 | 07 | 08 | 09 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| NUM-OBS | 31 | 31 | 31 | 31 | 31 | 31 | 31 | 31 | 31 | 30 | 30 | 30 | 31 | 31 | 31 | 31 | 30 | 30 | 31 | 31 | 31 | 31 | 31 | 31 |
| 1-HIGH | .053 | .050 | .073 | .081 | .180 | .157 | .168 | .364 | .256 | .182 | .135 | .047 | .048 | .052 | .052 | .089 | .111 | .031 | .050 | .013 | .044 | .037 | .061 | .092 |
| 2-HIGH | .034 | .047 | .064 | .069 | .137 | .134 | .157 | .164 | .226 | .182 | .128 | .045 | .033 | .044 | .043 | .023 | .026 | .028 | .029 | .010 | .030 | .020 | .038 | .057 |
| HR.AVG | .009 | .010 | .010 | .013 | .023 | .026 | .045 | .050 | .071 | .045 | .030 | .012 | .008 | .006 | .007 | .006 | .008 | .003 | .003 | .001 | .004 | .003 | .007 | .012 |

PLOT. . . . . . . CONCENTRATION VERSUS TIME (MON-SUN)
METHOD . . . . . CHEMILUMINESCENCE
UNITS . . . . . . PARTS PER MILLION
STANDARDS . . . (STATE) .50 PPM 1-HR AVG

PARAMETER . . SULFUR DIOXIDE
AREA. . . . . . 0080, YELLOWSTONE COUNTY
SITE. . . . . . 064, NORTH JOHNSON LANE
CITY. . . . . . BILLINGS

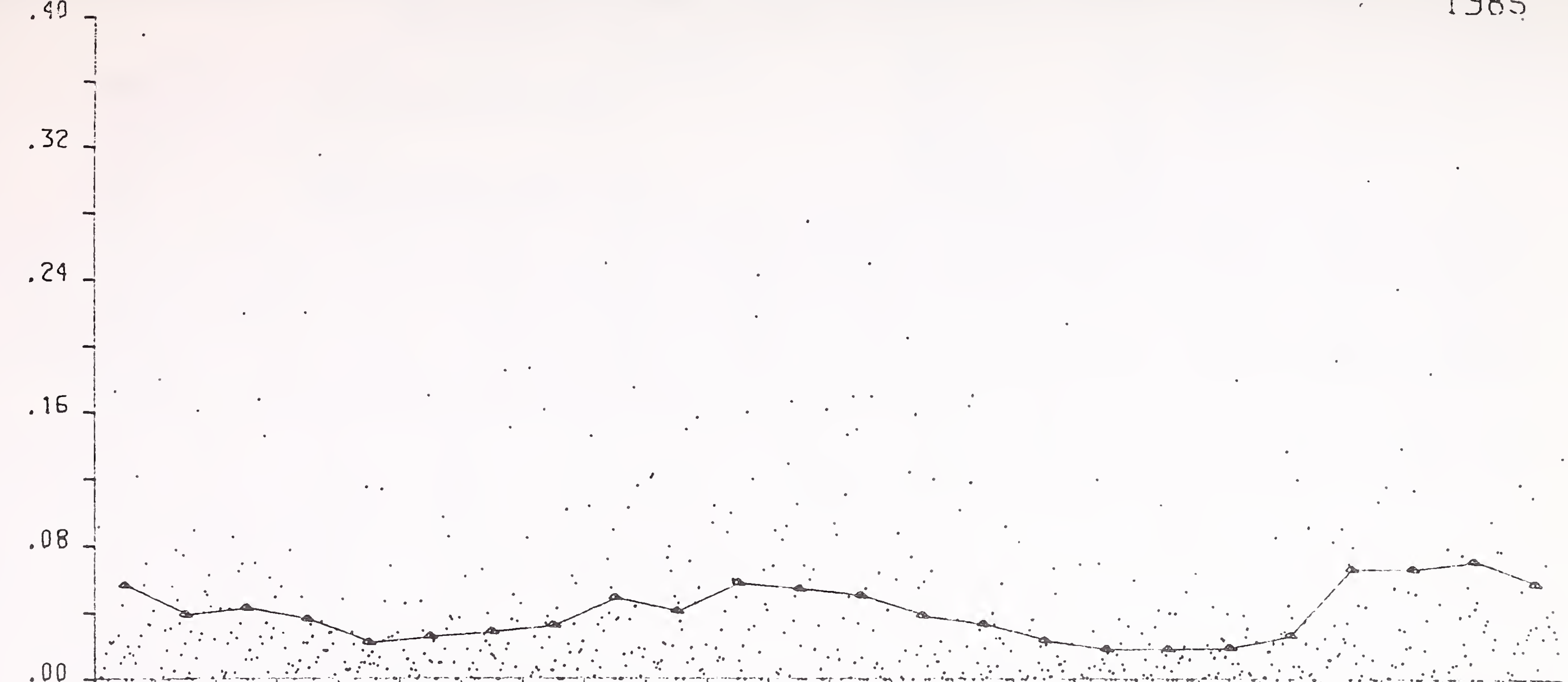
MONTANA STATE AIR QUALITY BUREAU

JULY 22, 1986

TECHNICAL SERVICES

Figure AP-12-I

JANUARY
1985



| | 00 | 01 | 02 | 03 | 04 | 05 | 06 | 07 | 08 | 09 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| NUM-OBS | 31 | 31 | 31 | 31 | 31 | 31 | 31 | 31 | 31 | 31 | 29 | 29 | 31 | 30 | 30 | 28 | 29 | 30 | 30 | 30 | 30 | 30 | 30 | 30 |
| 1-HIGH | .455 | .180 | .220 | .315 | .115 | .170 | .185 | .187 | .250 | .157 | .243 | .275 | .250 | .205 | .171 | .214 | .120 | .105 | .180 | .137 | .727 | .813 | .996 | .460 |
| 2-HIGH | .389 | .161 | .168 | .220 | .114 | .097 | .151 | .162 | .175 | .150 | .218 | .167 | .170 | .159 | .164 | .083 | .070 | .064 | .044 | .120 | .300 | .235 | .308 | .399 |
| HR.AVG | .057 | .040 | .043 | .037 | .022 | .026 | .029 | .033 | .049 | .041 | .058 | .055 | .051 | .039 | .034 | .024 | .019 | .019 | .019 | .027 | .067 | .067 | .071 | .058 |

PLOT. . . . . . CONCENTRATION VERSUS TIME (MON-SUN)
METHOD . . . . . CHEMILUMINESCENCE
UNITS . . . . . .PARTS PER MILLION
STANDARDS . . .(STATE) .50 PPM 1-HR AVG

PARAMETER . . SULFUR DIOXIDE
AREA. . . . . . .0080, YELLOWSTONE COUNTY
SITE. . . . . . .065, COBURN ROAD
CITY. . . . . . BILLINGS

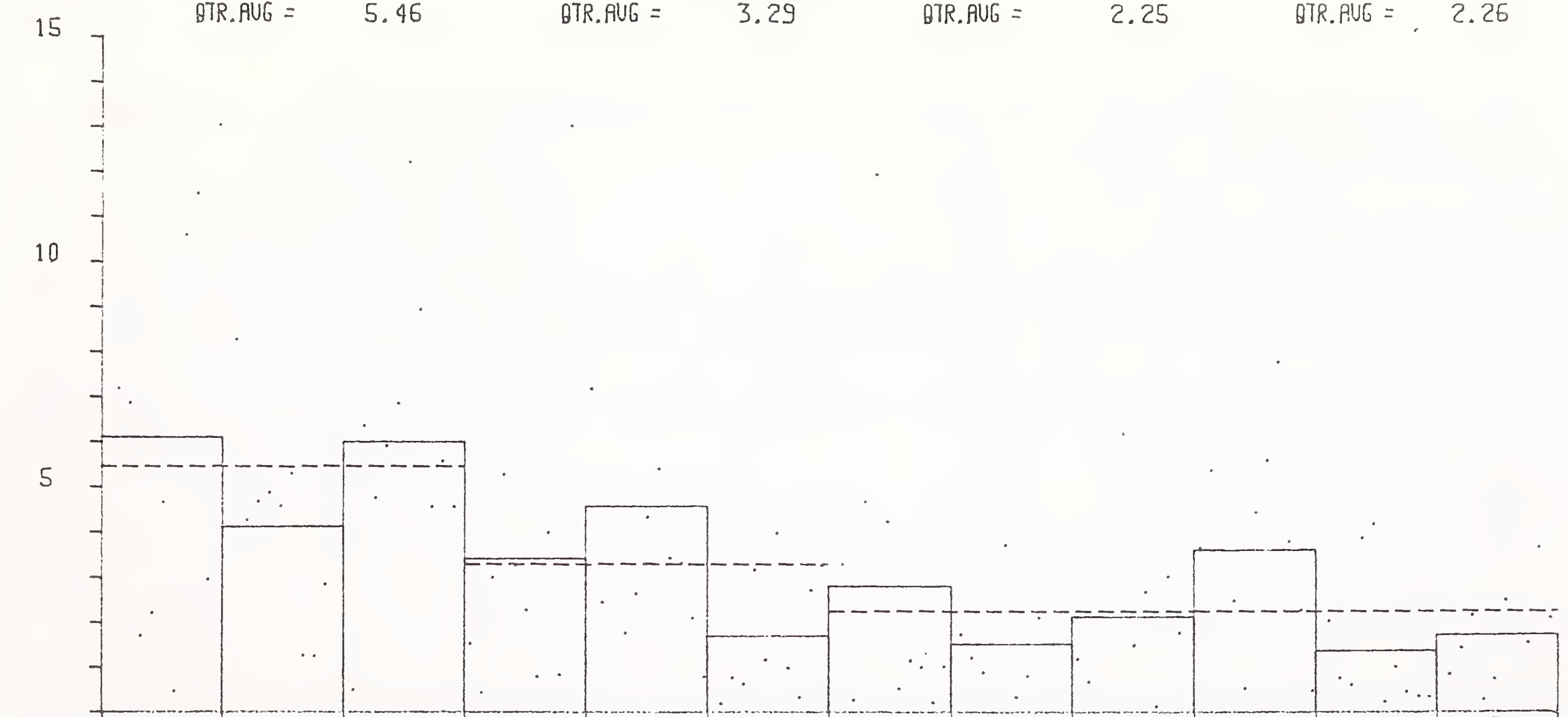
MONTANA STATE AIR QUALITY BUREAU

JULY 23, 1986

TECHNICAL SERVICES

1985

Figure AP-13-I



| | JAN | FEB | MAR | APR | MAY | JUN | JUL | AUG | SEP | OCT | NOV | DEC |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| NUM-OBS | 10 | 9 | 10 | 10 | 11 | 10 | 10 | 7 | 8 | 10 | 10 | 10 |
| 1-HIGH | 12.9 | 8.26 | 12.1 | 12.9 | 17.0 | 3.99 | 11.8 | 3.72 | 6.17 | 7.76 | 4.17 | 3.66 |
| 2-HIGH | 11.4 | 5.28 | 8.92 | 5.27 | 7.16 | 3.28 | 4.66 | 2.11 | 3.03 | 5.58 | 3.88 | 2.49 |
| MO.AVG | 6.11 | 4.13 | 6.00 | 3.44 | 4.58 | 1.72 | 2.83 | 1.55 | 2.15 | 3.63 | 1.39 | 1.75 |

PLOT. . . . . . . CONCENTRATION VERSUS TIME
METHOD . . . . . HI VOL
UNITS . . . . . . MICROGRAMS/CUBIC METER
STANDARDS . . . (FEDERAL) QUARTER - 1.5 UG/CU.M

PARAMETER . . LEAD
AREA. . . . . . 0860, LEWIS & CLARK COUNTY
SITE. . . . . . 714, FIREHALL
CITY. . . . . . EAST HELENA

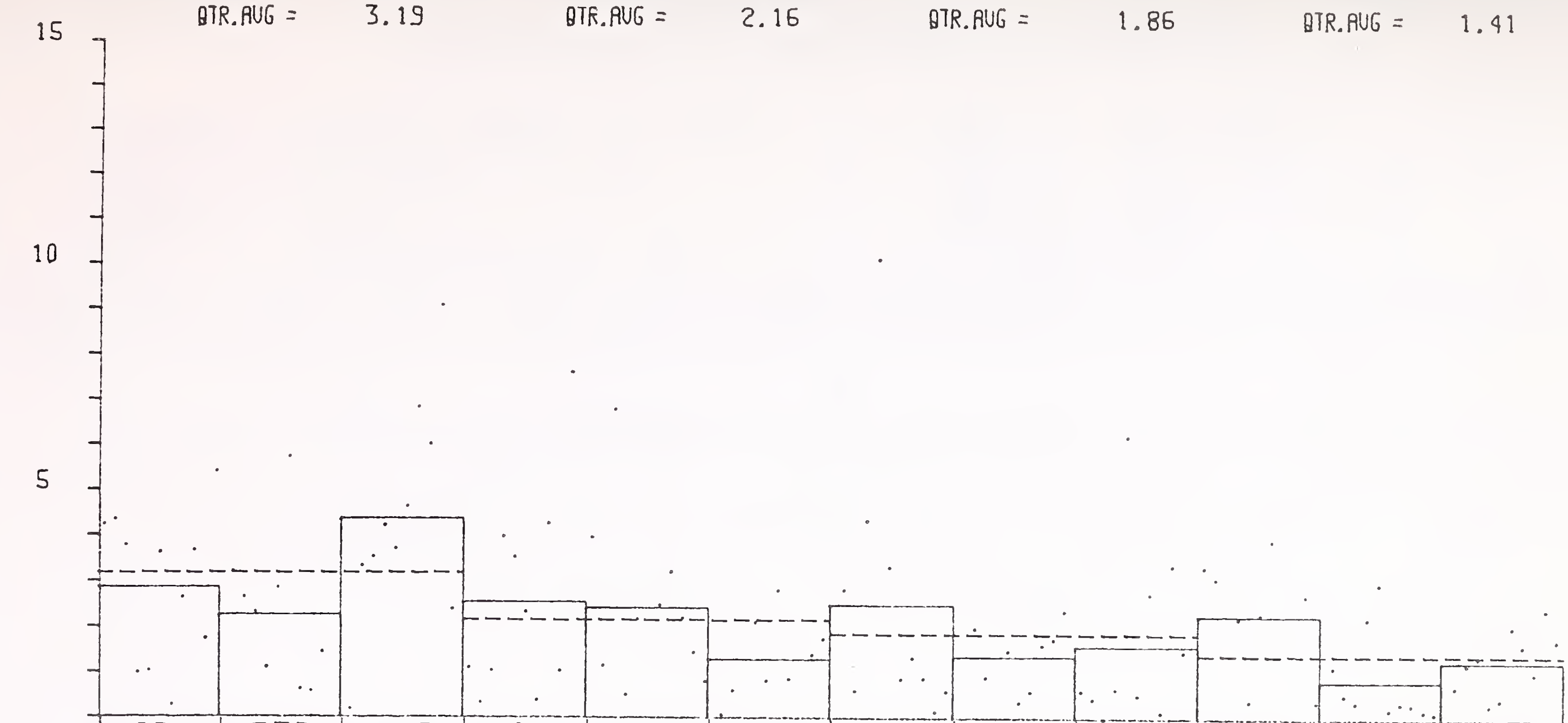
MONTANA STATE AIR QUALITY BUREAU

AUGUST 11, 1985

TECHNICAL SERVICES

1985

Figure AP-14-I



| | JAN | FEB | MAR | APR | MAY | JUN | JUL | AUG | SEP | OCT | NOV | DEC |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| NUM-OBS | 11 | 9 | 10 | 10 | 11 | 8 | 10 | 8 | 10 | 8 | 10 | 10 |
| 1-HIGH | 5.39 | 5.7 | 9.05 | 7.59 | 6.77 | 2.81 | 10.0 | 2.36 | 6.2 | 3.91 | 2.97 | 2.42 |
| 2-HIGH | 4.34 | 3.2 | 6.79 | 4.25 | 3.96 | 2.12 | 4.33 | 1.98 | 3.35 | 3.33 | 2.21 | 2.03 |
| MO.AVG | 2.88 | 2.27 | 4.37 | 2.55 | 2.44 | 1.30 | 2.50 | 1.38 | 1.61 | 2.29 | .846 | 1.28 |

PLOT. . . . . . . CONCENTRATION VERSUS TIME
METHOD . . . . . HI VOL
UNITS . . . . . . MICROGRAMS/CUBIC METER
STANDARDS . . . (FEDERAL) QUARTER - 1.5 UG/CU.M

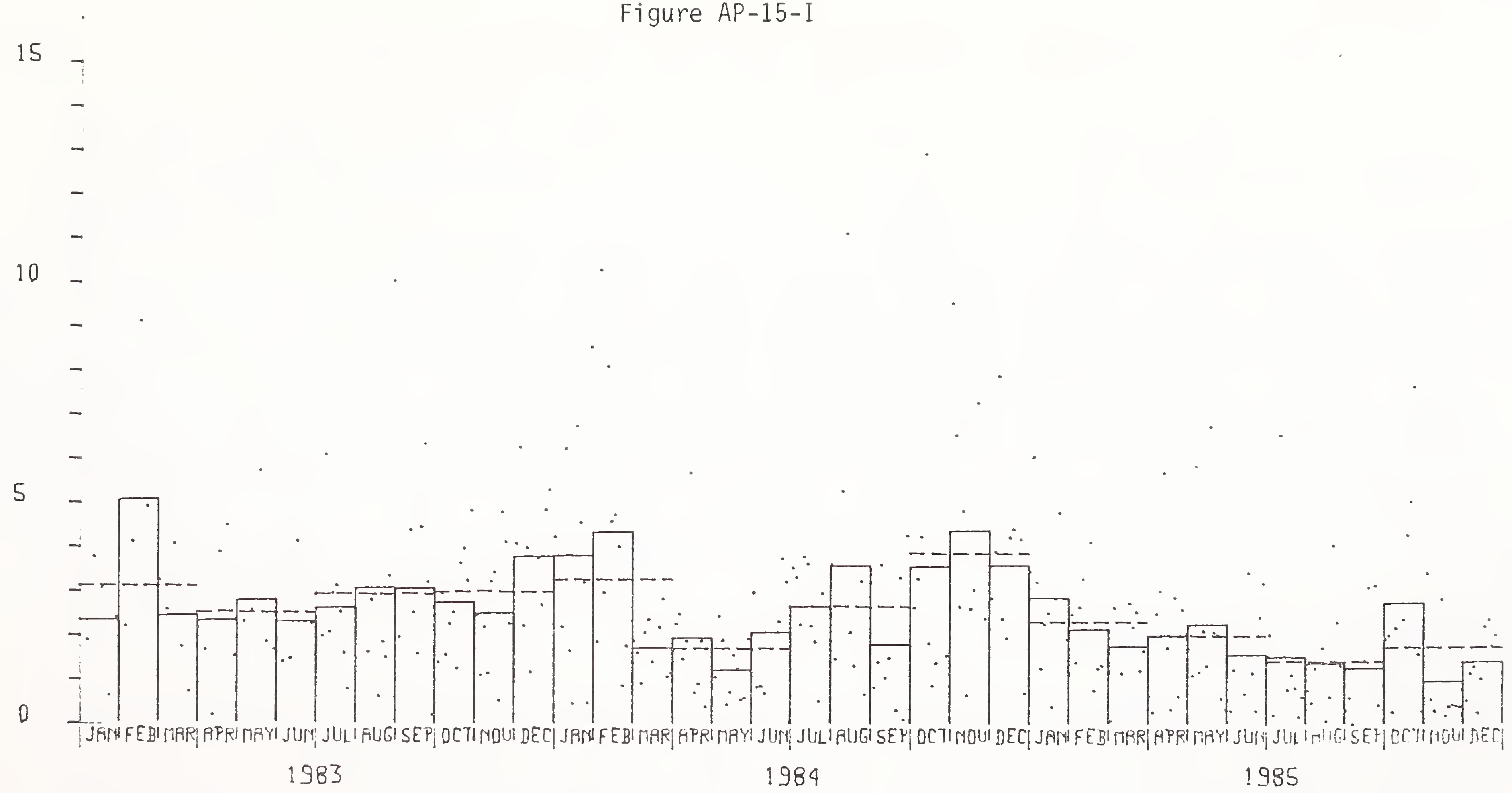
PARAMETER . . LEAD
AREA. . . . . . 0050, LEWIS & CLARK COUNTY
SITE. . . . . . 712, HADFIELD
CITY. . . . . . EAST HELENA

MONTANA STATE AIR QUALITY BUREAU

AUGUST 11, 1986

TECHNICAL SERVICES

Figure AP-15-I



| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| NUM OBS | 5 | 4 | 6 | 5 | 5 | 4 | 8 | 8 | 8 | 10 | 10 | 9 | 10 | 9 | 10 | 9 | 10 | 7 | 9 | 8 | 9 | 8 | 9 | 9 | 10 | 8 | 8 | 10 | 11 | 8 | 9 | 9 | 7 | 10 | 9 | 10 |
| MO.AVG | 2.3 | 5.0 | 2.4 | 2.3 | 2.8 | 2.3 | 2.6 | 3.0 | 3.0 | 2.7 | 2.5 | 3.8 | 3.8 | 4.3 | 1.7 | 1.9 | 1.2 | 2.0 | 2.6 | 3.5 | 1.8 | 3.5 | 4.3 | 3.6 | 2.8 | 2.1 | 1.7 | 2.0 | 2.2 | 1.5 | 1.5 | 1.4 | 1.2 | 2.7 | .99 | 1.4 |
| QTR.AVG | 3.11 | | | 2.51 | | | 2.93 | | | 2.99 | | | 3.26 | | | 1.71 | | | 2.66 | | | 3.86 | | | 2.31 | | | 1.99 | | | 1.41 | | | 1.75 | | |

PLOT . . . . . . CONCENTRATION VERSUS TIME
METHOD . . . . . HI VOL
UNITS . . . . . . MICROGRAMS/CUBIC METER
STANDARDS . . . (FEDERAL) QUARTER - 1.5 UG/CU.M

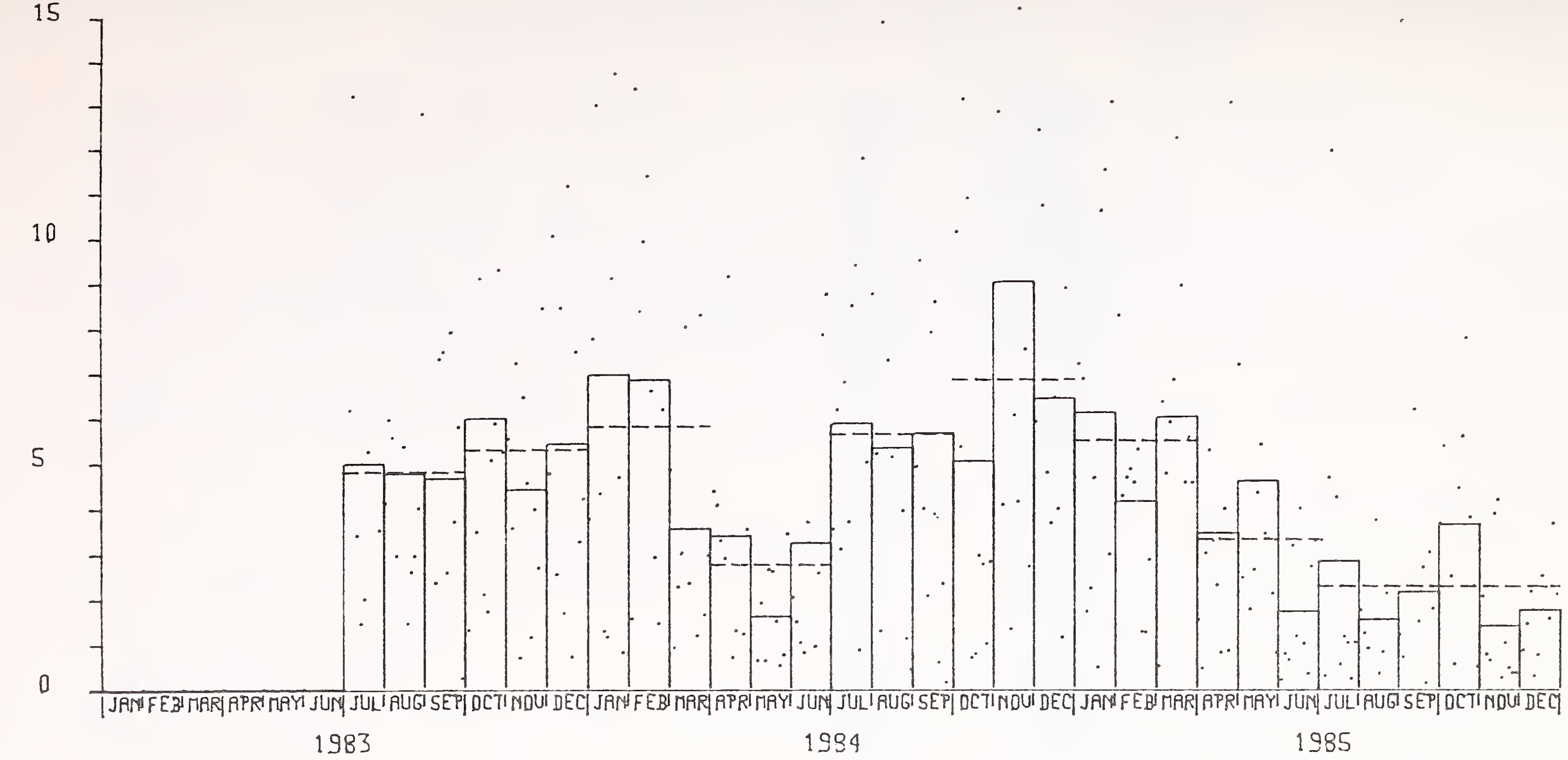
PARAMETER . . LEAD
AREA. . . . . . 0860, LEWIS & CLARK COUNTY
SITE. . . . . . 002, HASTIE
CITY. . . . . . EAST HELENA

## MONTANA STATE AIR QUALITY BUREAU

AUGUST 11, 1986

TECHNICAL SERVICES

Figure AP-16-I



| 1983 | JAN | FEB | MAR | APR | MAY | JUN | JUL | AUG | SEP | OCT | NOV | DEC |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| NUM OBS | | | | | | | 7 | 10 | 8 | 10 | 10 | 10 |
| MO.AVG | | | | | | | 4.9 | 4.7 | 4.6 | 5.9 | 4.4 | 5.4 |
| QTR.AVG | | | | | | | 4.78 | | | 5.25 | | |

| 1984 | JAN | FEB | MAR | APR | MAY | JUN | JUL | AUG | SEP | OCT | NOV | DEC |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| NUM OBS | 11 | 9 | 10 | 9 | 9 | 9 | 10 | 9 | 10 | 10 | 10 | 9 |
| MO.AVG | 6.9 | 6.8 | 3.5 | 3.3 | 1.6 | 3.2 | 5.8 | 5.3 | 5.6 | 5.0 | 8.9 | 6.4 |
| QTR.AVG | 5.77 | | | 2.74 | | | 5.61 | | | 6.82 | | |

| 1985 | JAN | FEB | MAR | APR | MAY | JUN | JUL | AUG | SEP | OCT | NOV | DEC |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| NUM OBS | 10 | 9 | 10 | 10 | 11 | 10 | 10 | 7 | 8 | 10 | 10 | 10 |
| MO.AVG | 6.1 | 4.1 | 6.0 | 3.4 | 4.5 | 1.7 | 2.8 | 1.5 | 2.1 | 3.6 | 1.3 | 1.7 |
| QTR.AVG | 5.46 | | | 3.29 | | | 2.25 | | | 2.26 | | |

PLOT. . . . . . . CONCENTRATION VERSUS TIME
METHOD . . . . . HI VOL
UNITS . . . . . . MICROGRAMS/CUBIC METER
STANDARDS . . . (FEDERAL) QUARTER - 1.5 UG/CU.M

PARAMETER . . LEAD
AREA. . . . . . 0860, LEWIS & CLARK COUNTY
SITE. . . . . . 714, FIREHALL
CITY. . . . . . EAST HELENA

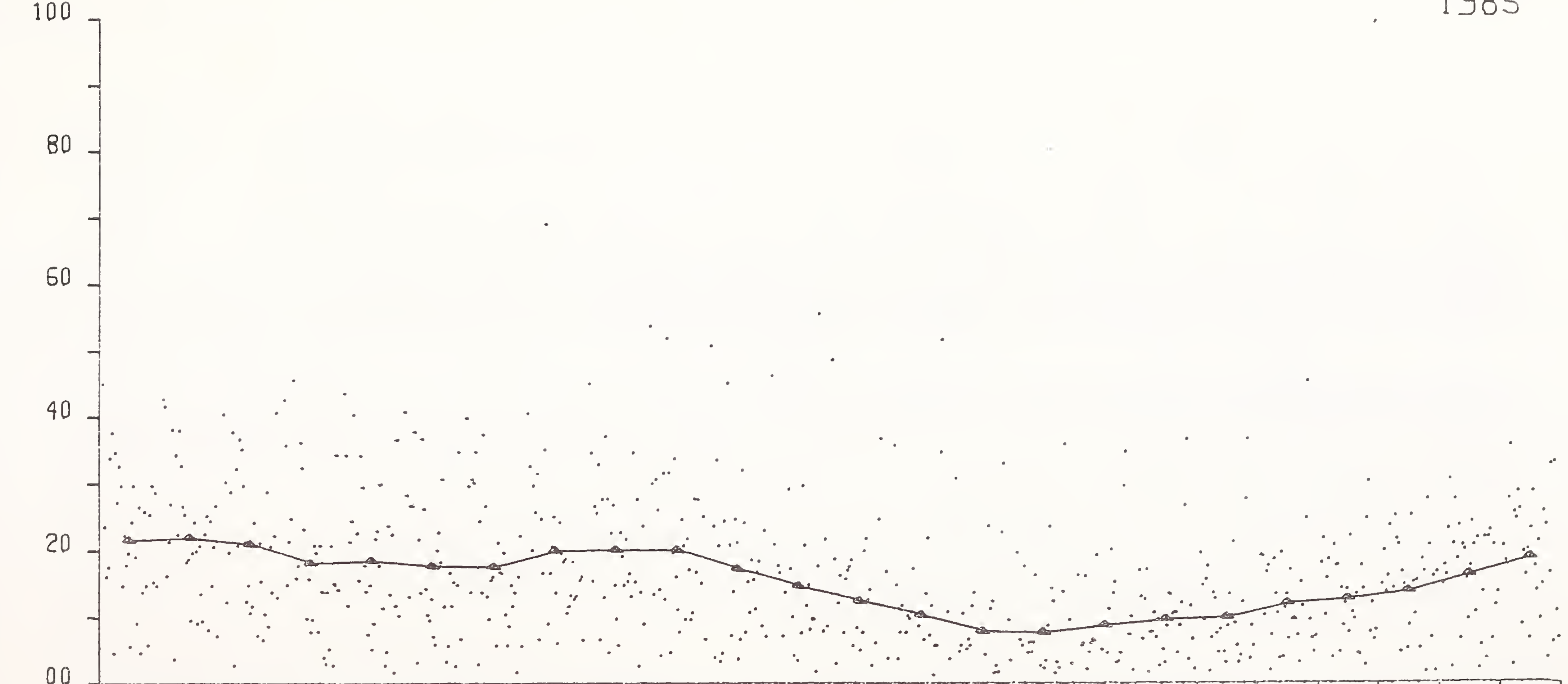
## MONTANA STATE AIR QUALITY BUREAU

AUGUST 11, 1985

TECHNICAL SERVICES

Figure AP-17-I

OCTOBER
1985



| | 00 | 01 | 02 | 03 | 04 | 05 | 06 | 07 | 08 | 09 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| NUM-OBS | 31 | 31 | 31 | 31 | 31 | 31 | 31 | 31 | 31 | 31 | 30 | 29 | 29 | 30 | 29 | 29 | 30 | 31 | 31 | 31 | 31 | 31 | 31 | 31 |
| 1-HIGH | 45.1 | 42.7 | 40.7 | 45.6 | 43.6 | 40.8 | 39.9 | 69.2 | 45.2 | 53.8 | 50.7 | 55.6 | 48.7 | 51.7 | 33.0 | 35.9 | 34.7 | 36.6 | 36.7 | 45.5 | 30.3 | 27.7 | 30.6 | 35.7 |
| 2-HIGH | 37.7 | 41.7 | 40.5 | 42.7 | 40.4 | 37.7 | 37.5 | 40.7 | 37.2 | 52.0 | 45.1 | 46.3 | 36.7 | 35.7 | 30.7 | 23.6 | 29.7 | 26.7 | 27.7 | 24.8 | 24.8 | 25.3 | 27.7 | 33.1 |
| HR.AVG | 21.7 | 22.1 | 21.0 | 18.3 | 18.6 | 17.7 | 17.7 | 20.1 | 20.3 | 20.3 | 17.3 | 14.7 | 12.5 | 10.4 | 7.96 | 7.81 | 8.87 | 9.84 | 10.1 | 12.2 | 12.8 | 14.0 | 16.4 | 18.9 |

PLOT. . . . . . . CONCENTRATION VERSUS TIME (MON-SUN)
METHOD . . . . . NEPHELOMETER
UNITS . . . . . . SCATTER COEFFICIENT (X10**5)
STANDARDS . . . (STATE) 3X10**-5/METER

PARAMETER . . BETA (LIGHT) SCATTER
AREA. . . . . . 0900, LINCOLN COUNTY
SITE. . . . . . 013, RIVER SITE
CITY. . . . . . LIBBY

MONTANA STATE AIR QUALITY BUREAU

4 AUGUST, 1986

TECHNICAL SERVICES

# APPENDIX J

## Smoke Management

# APPENDIX J

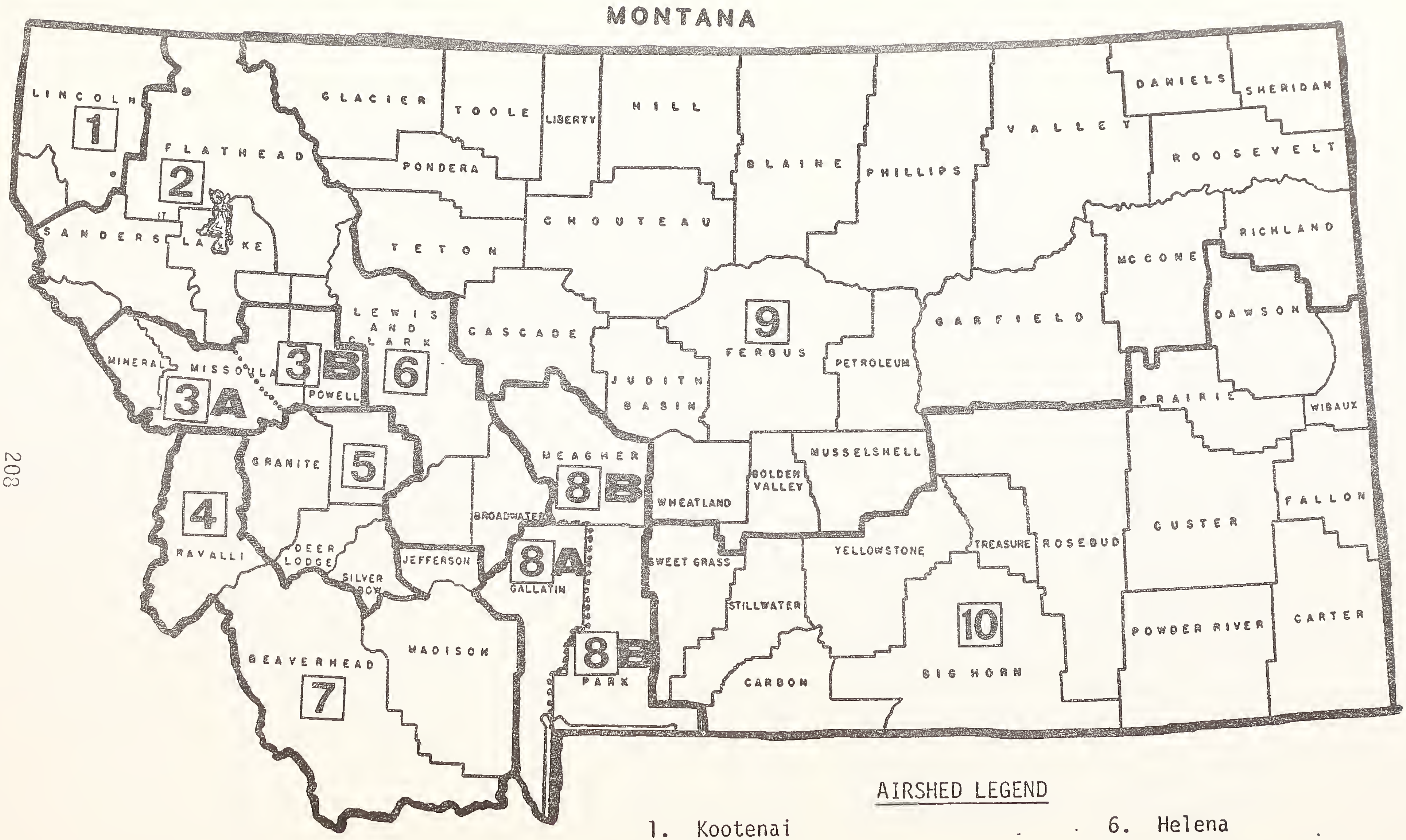
## SMOKE MANAGEMENT

The Smoke Management Plan was devised by the State Airshed Group to coordinate burning operations on all forest and rangeland in the state. The State Airshed Group consists of representatives from the following agencies and forest products industries:

Air Quality Bureau
U. S. Forest Service
Bureau of Land Management
National Weather Service
Glacier National Park
Yellowstone National Park
U.S. Dept. of Fish & Wildlife
Champion International
Bureau of Indian Affairs
Montana Division of Forestry
Plum Creek Timber Company
Mont. Dept. of Fish, Wildlife & Parks
Missoula City-County Air Pollution Control Board

From September 1 to November 30 each year, a two-person monitoring team is established at the Montana Division of Forestry office in Missoula. This team gathers meteorological information daily and has the authority to issue burning restrictions on days forecast for poor ventilation. Restrictions are issued only for those areas predicted to experience inversions or poor dispersion. Restriction information is available from the U. S. Forest Service Fire Weather network, or by calling the state toll-free number (1-800-225-6779). The map on the following page (Figure AP-1-J) shows the ten designated airsheds in Montana. The success of this plan involves the cooperative effort of all organizations involved in the use of prescribed burning for disposal of slash and other accepted land management practices.

# MONTANA AIRSHEDS 1935


MONTANA
LINCOLN
1
FLATHEAD
2
SANDERS
LAKE
GLACIER
TOOLE
LIBERTY
HILL
BLAINE
PHILLIPS
VALLEY
DANIELS
SHERIDAN
ROOSEVELT
PONDERA
TETON
CHOUTEAU
RICHLAND
MC CONE
DAWSON
GARFIELD
PETROLEUM
FERGUS
9
JUDITH BASIN
CASCADE
LEWIS AND CLARK
6
3B
POWELL
MINERAL
MISSOULA
3A
GRANITE
5
RAVALLI
4
DEER LODGE
SILVER BOW
JEFFERSON
BROADWATER
MEAGHER
8B
GALLATIN
8A
PARK
8B
WHEATLAND
GOLDEN VALLEY
MUSSELSHELL
PRAIRIE
WIBAUX
FALLON
CUSTER
ROSEBUD
TREASURE
YELLOWSTONE
SWEET GRASS
STILLWATER
CARBON
BIG HORN
10
POWDER RIVER
CARTER
BEAVERHEAD
7
MADISON

## AIRSHED LEGEND

1. Kootenai
2. Flathead
3. Blackfoot-Clark Fork
4. Bitterroot
5. Upper Clark Fork
6. Helena
7. Beaverhead
8. A. Gallatin
   B. Park
9. Missouri
10. Yellowstone

Figure AP-1-J

# APPENDIX K

## Hi-vol Schedules

# APPENDIX K

# HI-VOL SCHEDULES

High volume samplers (hi-vols) are usually operated on a one-in-six day schedule. In order to meet the needs of data collectors or hi-vol operators, hi-vol schedules for 1986 and 1987 are presented on the following pages.

Figure AP-1-K

# 1986

## 1986 SAMPLING SCHEDULE

(Every 6th Day)

### QUARTER 1

| January - | February - | March - |
|---|---|---|
| 2 | 1 | 3 |
| 8 | 7 | 9 |
| 14 | 13 | 15 |
| 20 | 19 | 21 |
| 26 | 25 | 27 |

### QUARTER 2

| April - | May - | June - |
|---|---|---|
| 2 | 2 | 1 |
| 8 | 8 | 7 |
| 14 | 14 | 13 |
| 20 | 20 | 19 |
| 26 | 26 | 25 |

### QUARTER 3

| July - | August - | September - |
|---|---|---|
| 1 | 6 | 5 |
| 7 | 12 | 11 |
| 13 | 18 | 17 |
| 19 | 24 | 23 |
| 25 | 30 | 29 |
| 31 | | |

### QUARTER 4

| October - | November - | December - |
|---|---|---|
| 5 | 4 | 4 |
| 11 | 10 | 10 |
| 17 | 16 | 16 |
| 23 | 22 | 22 |
| 29 | 28 | 28 |

| January (1987) - |
|---|
| 3 |
| 9 |
| 15 |
| 21 |
| 27 |

NOTE: The sampler should start at midnight, run for 24 hours on the date shown, and be stopped at midnight.

Figure AP-2-K

# 1987

## 1987 SAMPLING SCHEDULE

(Every Sixth Day)

### QUARTER 1

| January - | February - | March - |
|---|---|---|
| 3 | 2 | 4 |
| 9 | 8 | 10 |
| 15 | 14 | 16 |
| 21 | 20 | 22 |
| 27 | 26 | 28 |

### QUARTER 2

| April - | May - | June - |
|---|---|---|
| 3 | 3 | 2 |
| 9 | 9 | 8 |
| 15 | 15 | 14 |
| 21 | 21 | 20 |
| 27 | 27 | 26 |

### QUARTER 3

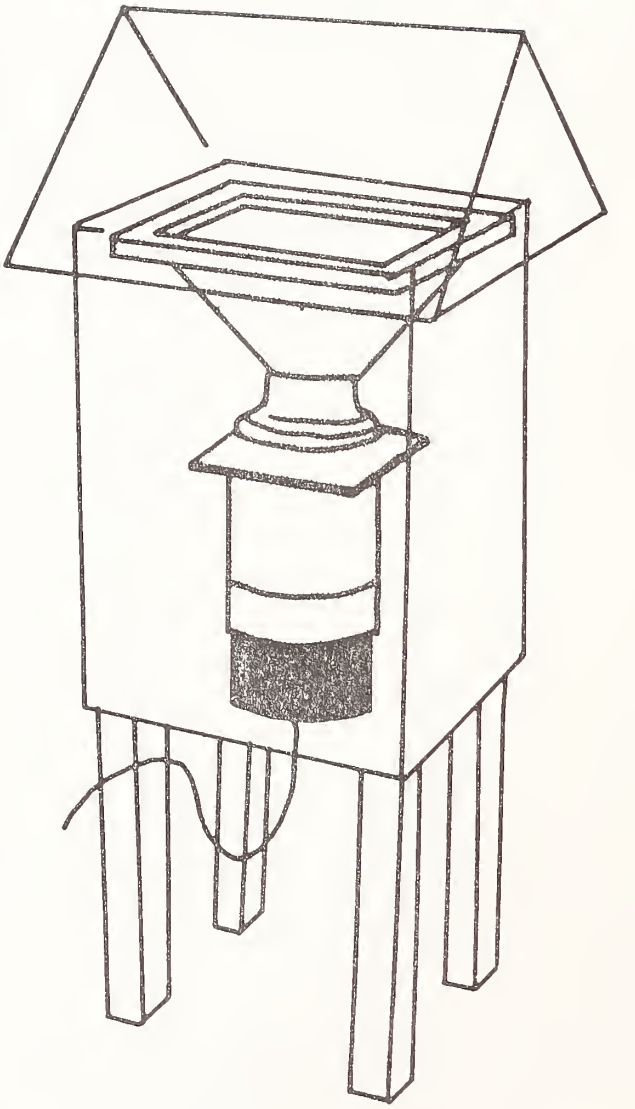
| July - | August - | September - |
|---|---|---|
| 2 | 1 | 6 |
| 8 | 7 | 12 |
| 14 | 13 | 18 |
| 20 | 19 | 24 |
| 26 | 25 | 30 |
|  | 31 |  |

### QUARTER 4

| October - | November - | December - |
|---|---|---|
| 6 | 5 | 5 |
| 12 | 11 | 11 |
| 18 | 17 | 17 |
| 24 | 23 | 23 |
| 30 | 29 | 29 |

| January - |
|---|
| 4 |
| 10 |
| 16 |
| 22 |
| 28 |

NOTE: The sampler should start at midnight, run for 24 hours on the date shown, and be stopped at midnight.



# APPENDIX L

## Visible Emission Documentation

# APPENDIX L

# VISIBLE EMISSION DOCUMENTATION

Visible emission documentation on a pollution source is performed by a trained observer in the field. A pollution source may be a teepee burner, asphalt plant, boiler, power plant or any stack or emission point that might exhibit a plume.

Visible emission readings are taken by the observer in five percent increments of opacity. Opacity is defined as the degree, expressed in percent, to which emissions reduce the transmission of light and obscure the view of an object in the background.

All point sources have opacity limitations. These are listed in the air quality rules. The opacity standards range from 10 to 40 percent and depend on the type and age of the source.

In order for a person to become a trained observer, he or she must attend a visible emissions documentation course or "smoke school." The Air Quality Bureau offers a smoke school twice each year, usually in April and October. The observer must attend a lecture session and pass a field session in order to pass smoke school.

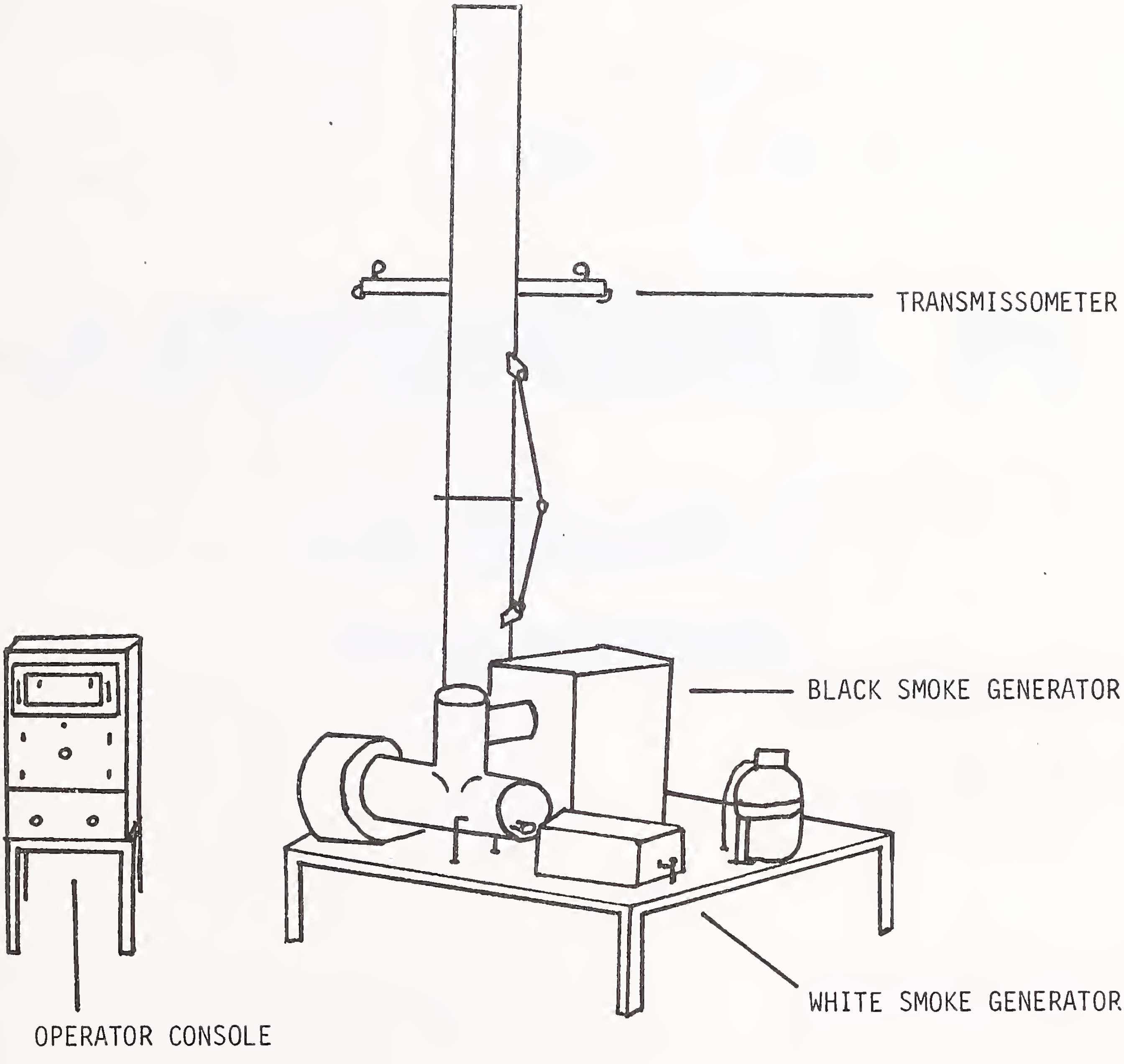
The lecture section includes the following topics:

Definition of opacity
Composition of Plumes
Meteorological aspect of Plumes
Smoke Generator
Method 9 Certification Procedures and Field Documentation
Opacity Regulations
Legal Aspects of Opacity

During the field portion, the observer reads the opacity of 25 black and 25 white smoke plumes produced by a smoke generator. Observed opacities are compared with measured opacities (transmissometer readings) and a certain degree of accuracy is needed to pass.

After a person passes smoke school, that observer is qualified to read the opacity of a plume in the field. A plume must be read every 15 seconds for six minutes, for a total of 24 readings. An average of the 24 readings gives the percent opacity. Care must be taken not to read a steam plume if one exists.

A drawing of the smoke generator (Figure AP-1-L) and a visible emission documentation form (Figure AP-2-L) are copied on the following pages.


TRANSMISSOMETER
BLACK SMOKE GENERATOR
WHITE SMOKE GENERATOR
OPERATOR CONSOLE

ENVIRONMENTAL INDUSTRIES

MODEL 3000

SMOKE GENERATOR

Figure AP-1-L

MONTANA STATE DEPARTMENT OF HEALTH AND ENVIRONMENTAL SCIENCES
AIR QUALITY BUREAU

VISIBLE EMISSIONS FIELD DOCUMENTATION

FIRM NAME ____________________ DATE ____________________
ADDRESS ____________________ START TIME ____________________
BUSINESS ____________________ STOP TIME ____________________
DESCRIPTION OF SOURCE ____________________ OBSERVER ____________________
____________________ OBSERVATION POINT ____________________
TYPE OF FUEL ____________________ ____________________
STACK HEIGHT __________ STACK DIAMETER __________ ____________________
DISTANCE FROM STACK ____________________ ☐ RESPONSE TO COMPLAINT
DIRECTION FROM STACK ____________________ ☐ ROUTINE INSPECTION
GENERAL PLUME CHARACTERISTICS (COLOR, ETC.) ______ ☐ OBSERVATION
____________________ ☐ SPECIAL INVESTIGATION

GENERAL METEOROLOGY: SKY CONDITIONS AND COLOR ____________________ EST. AMBIENT AIR TEMP. __________ EST. WIND SPEED __________ DIRECTION __________ EST. RELATIVE HUMIDITY ______

PLUME DENSITY READINGS: IN OPACITY

| MIN \ SEC | 0 | 15 | 30 | 45 | REMARKS |
|---|---|---|---|---|---|
| 0 | | | | | |
| 1 | | | | | |
| 2 | | | | | |
| 3 | | | | | |
| 4 | | | | | |
| 5 | | | | | |

| MIN \ SEC | 0 | 15 | 30 | 45 | REMARKS |
|---|---|---|---|---|---|
| 0 | | | | | |
| 1 | | | | | |
| 2 | | | | | |
| 3 | | | | | |
| 4 | | | | | |
| 5 | | | | | |

| | | | | |
|---|---|---|---|---|
| 0 | | | | |
| 1 | | | | |
| 2 | | | | |
| 3 | | | | |
| 4 | | | | |
| 5 | | | | |

| | | | | |
|---|---|---|---|---|
| 0 | | | | |
| 1 | | | | |
| 2 | | | | |
| 3 | | | | |
| 4 | | | | |
| 5 | | | | |

| | | | | |
|---|---|---|---|---|
| 0 | | | | |
| 1 | | | | |
| 2 | | | | |
| 3 | | | | |
| 4 | | | | |
| 5 | | | | |

| | | | | |
|---|---|---|---|---|
| 0 | | | | |
| 1 | | | | |
| 2 | | | | |
| 3 | | | | |
| 4 | | | | |
| 5 | | | | |

Figure AP-2-L

VISIBLE EMISSION DOCUMENTATION FORM

OTHER REMARKS ____________________
____________________
____________________

AVERAGE PLUME DENSITY OPACITY __________ TOTAL MINUTES IN VIOLATION __________
IF VIOLATION NOTED, PERSON CONTACTED ____________________ DATE __________ TIME ______

# APPENDIX M

## Air Quality Personnel

# APPENDIX M

## AIR QUALITY PERSONNEL
## 1985

### Air Quality Bureau

(406) 444-3454
(406) 248-3266 (Billings)

Harold Robbins, Chief
Dean Arthun (Billings)
John Coefield
Patricia Davidson
Pat Driscoll
Kay Hansen
Charles Homer
Shirley Quick Jasper
Bob Jeffrey
Harry Keltz
Jackley Meyers
Warren Norton
Jim Olsen
Jerry Preszler
Bob Raisch
Jerry Schneider
Stan Sternberg
Ross Yeager (Billings)

### Cascade County Air Pollution Control

(406) 761-1190

William Neilsen
Bruce Treis

### Lewis and Clark County

(406) 443-1010

Joan Miles
Pam Campbell

### Missoula City-County Health Department

(406) 721-5700

Linda Hedstrom
Jim Carlson
Scott Church
Pat Thorson

Yellowstone County Air Pollution Control

(406) 252-0756

Steve Duganz
Russ Boschee

# APPENDIX N

## Air Monitoring Equipment

# APPENDIX N

## Air Monitoring Equipment

This appendix is intended to give the data and information user a brief description of how air monitoring equipment works. Most of the information contained in this appendix was taken from the Air Quality Bureau's Quality Assurance Handbook.

Table AP-N-I gives a summary of the various pollutants and their analytical procedure.

Table AP-N-I
Pollutants and Analytical Procedures

| Analyte | Procedure |
|---|---|
| Total Suspended Particulate | Filter Impaction/Gravimetric Analysis |
| Particulates | Beta Attenuation |
| Respirable Particulates (PM10) | Size Selective Hi-vol/Gravimetric Analysis |
| Respirable Particulates | Dichotomous Virtual Impactor/ Gravimetric Analysis |
| Lead | Filter Impaction/Atomic Absorption Spectrophotometry/ICAP |
| Carbon Monoxide | Non-dispersive Infrared |
| Sulfur Dioxide | Pulsed Fluorescence |
| Hydrogen Sulfide and Sulfur Dioxide | Gas Chromatography and Flame Photometric Detection |
| Nitrogen Oxides | Chemiluminescence |
| Ozone | Ultraviolet Photometry |
| Fluoride | Dual Tape Sampler |
| Gaseous and Particulate Fluorides | Bicarbonate Tube |
| Foliar Fluoride | Colorimetric Method |
| Visibility | Integrating Nephelometer |
| Metals | ICP or ICAP |

Analyte: Total Suspended Particulates (TSP)

Procedure: Filter impaction/gravimetric analysis

General Information:

Particulate matter is collected by a high volume sampler (hi-vol) by pulling a known volume of air through a preweighed glass fiber filter. As the air is pulled through the filter, particulate matter that is suspended in the air is impacted onto the filter material. After the sampler has run for 24 hours, the filter is reweighed. The weight of the particulate matter (grams) on the filter is divided by the volume of air [cubic meters ($m^3$)] to give a concentration in micrograms per cubic meter ($ug/m^3$).

The hi-vol is constructed of aluminum in the shape of a box (dimensions 16" x 16" x 48") with a pitched roof. The interior contains a "vacuum cleaner" type electric motor, a filter holder, a flow measuring device(s), and a timer. The samplers usually run on a one-in-six day schedule but may be run more frequently if necessary.

The filters are weighed on a laboratory balance in a temperature and humidity controlled room. The balance must be accurate to one tenth of a milligram (0.1 mg) or one ten thousandth of a gram. The filters are dessicated for twenty-four hours prior to weighing.

Analyte: Particulates

Procedures: Beta attenuation

General Information:

This analyzer measures concentrations of airborne particulates, integrated over preprogrammed time intervals, by the process of beta ray attenuation. Samples are collected on strips of glass fiber tape. Before the sample is collected, the tape is positioned between a beta ray source (C14) and a geiger counter. The beta ray count taken through the tape is used as a blank value. Sample is deposited on the tape by a constant flow of ambient air. The sample and tape are again situated between the source and counter. This second count will be lower than the first count because the sample will absorb some of the beta rays in excess to the amount of X-rays absorbed by the tape itself. The difference in beta ray counts between the tape and the tape plus sample is log proportional to the amount of sample on the tape. After calculating the sample mass, it is divided by the total airflow over the sample collection period. This gives an integrated particulate concentration for that sample period. All calculations are done internally by the analyzer with a microprocessor. Sample times as low as 3 minutes or as great as 999 minutes can be programmed by the user.

Analyte: Respirable Particulates (PM10)

Procedure: Size Selective Hi-vol/Gravimetric Analysis

General Information:

The PM10 size selective high volume air sampler operates at a high flow rate of 40 cfm and is the same as a TSP hi-vol, but samples suspended particles smaller than 10 microns on an 8" x 10" hi-vol filter.

Suspended particles in the air are sampled at 40 cfm through the circumferential inlet of the size selective inlet. The symmetrical design insures wind direction insensitivity. The inlet design and the internal configuration make the collection efficiency dependent of wind speed from 0 to 24 kilometers per hour. Air is drawn into the inlet and deflected downward into the acceleration jets of the first stage fractionator. By virtue of their larger momentum, particles greater than the 10 micron cutpoint impact onto the first stage collection plate. The remaining particles are carried vertically upward by the air flow and then down through the second fractionation stage which strips additional 10 micron and larger particles. All remaining particles are drawn out of the inlet and through the 8" x 10" sampling filter. Just as in standard hi-vol TSP sampling, the filter is weighed before and after sampling. The weight increase is the mass of particles smaller than 10 microns. The air volume is properly totalized by maintaining constant flow rate with a flow controller.

Analyte: Respirable and Inhalable Particulates

Procedure: Dichotomous or Virtual Impactor

General Information:

The dichotomous sampler is designed to sample for particulates of two size ranges: 1) those particles less than 3.5 microns (aerodynamic diameter), and 2) those particles greater than 3.5 microns and less than 15 microns. Two 37 millimeter diameter filters collect the particulate, one filter for each size range. The filters are weighed before and after each run to determine the mass loading on each filter. Concentration is then calculated by dividing the net weight by the air flow through each filter. Two rotometers are installed on the sampler to measure the flow during the run.

This type of instrument is divided into two sections: the sampling module and the control module. The sampling module contains the sampling head separation device and the two filters. The control module contains the air pump, flow controller, rotameters and the clock mechanism. The two units are connected by polypropylene tubing.

The sampling module is the portion where the actual separation and collection of each particle size is accomplished. The particles larger than 15 microns are eliminated at the round sampling head. A bug screen is placed in the sampling head to keep out insects and to collect particles larger than 15 microns. The particles less than 15 microns proceed down the sampling tube to the nozzle. The nozzle accelerates the particles and forces the majority of air (approximately 90%) to make a sharp 90° turn in a very short distance. This 90° turn is the principle on which the separation is based. Any heavy particle (i.e., any particle greater than 3.5 microns) will not be able to make this sudden turn. These particles will be drawn down into the coarse particles tube which is located straight below the nozzle. The other particles (less than 3.5 microns) will make the 90° turn and will be drawn down the fine particle tube. At the bottom of both tubes are the appropriate filters. The air flow is drawn from the control module through the 3/8" and 1/4" lines.

The filters are weighed on a microbalance in a temperature and humidity controlled room. The balance must be accurate to one millionth of a gram (0.000001 gm). The filters are dessicated for twenty-four hours prior to weighing.

Analyte: Lead

Procedure: Atomic Absorption Spectrophotometry

General Information:

Lead is sampled in the field using a standard high volume air sampler. This sampler pulls a large volume of air through a glass fiber filter. The filter is then normally mailed from the field site to the Air Quality Bureau where the sample is logged in. The volume of the air sample is calculated and then it is transferred to the laboratory for analysis. The filter is equilibrated and weighed for total suspended particulate. Then the filter must be extracted using an acidic solution to solubilize the lead on the filter. The resulting solution is analyzed using atomic absorption spectrophotometry or ICAP to determine the amount of lead present.

Analyte: Carbon Monoxide

Procedures: Non-dispersive Infrared

General Information:

The (carbon monoxide) analyzer measures continuous amounts of carbon monoxide from 0-50 to 0-1000 ppm full scale deflection. The detector operates on an infrared absorption principle.

The analyzer detects carbon monoxide from the absorption of infrared radiation. Non-dispersive infrared radiation is introduced to the detector with a double-beam arrangement. The infrared beams pass through two cells: 1) a sealed reference cell filled with a non-absorbing gas, and 2) a sample cell through which the sample air containing the carbon monoxide is continuously drawn.

The infrared gas analyzer utilizes the measurement principle based on CO having a known characteristic absorption spectra in the infrared range. The analyzer contains an infrared detector that uses the non-dispersive single beam technique with alternate modulation of the sample and reference cells. The reference cell is filled with a non-absorbing gas and sealed, and the sample is routed through the sample cell. With no CO present in the sample, the amounts of radiation coupled into the detector from the sample and reference cells will be essentially equal, effectively cancelling in the detector and producing no output. When CO is present in the sample, some radiation is absorbed by the CO, causing the detector inputs to be unequal, and producing a capacitance change in the detector. The detector is so designed that the amount of capacitance change in the detector is equivalent to a known amount of CO. The infrared radiation is chopped by an optical chopper to cause a periodic capacitance change, which modulates a radio frequency signal from an oscillator. This signal is subsequently demodulated, amplified, and the output is fed to the front panel meter as well as to a strip chart recorder.

Analyte: Sulfur Dioxide

Procedures: Pulsed Fluorescence

General Information:

The sample airstream is exposed to a pulsating ultraviolet light, which electromagnetically excites sulfur dioxide molecules in the air sample. The excited $SO_2$ molecule quickly decays to its ground state emitting a photon of fluorescent light, whose intensity is measured by a photomultiplier tube. The wavelength of excitation light entering the detection chamber and the wavelength of fluorescent light entering the photomultiplier tube both are carefully controlled by narrow bandpass filters, which reduce interference from other fluorescent species in the sample gas. The light is pulsed for six reasons: long UV lamp life, high intensity UV without lamp heating, small lamp size for UV output, low lamp power requirements, long-term UV stability, and chopped signal processing (alternatively measuring signal and photomultiplier dark current). After the photomultiplier dark current is subtracted from the fluorescent $SO_2$ signal, the signal output is directly proportional to the concentration of $SO_2$ in the sample gas.

Analyte: Hydrogen Sulfide and Sulfur Dioxide

Procedures: Gas Chromatography and Flame Photometric Detection

General Information:

Ambient air entering the analyzer is separated into two fragments by a gas chromatographic column, one part containing any sulfur dioxide present in the sample and the second component consisting of any hydrogen sulfide. The amount of sulfur atoms in each fragment is detected by a flame photometer. This detection principle consists of burning the sample in a hydrogen rich flame, which produces the excited reduced species $S_2$. The $S_2$ decays to ground state emitting a photo near 390nm. This photon is sensed by a photomultiplier tube. Because the measured molecule is a sulfur dimer, the photomultiplier output (picoamps) is nonlinear with respect to ambient sulfur concentrations. The output is approximately to the 1.8 power of the ambient concentration. Deviation from the theoretical second power is due to quenching of the excited species. The photomultiplier output is linearized by a set of logarithmic amplifiers. The rest of the analyzer consists of flow control devices and temperature controllers for the detector oven and column.

Analyte: Nitrogen Oxides

Procedures: Chemiluminescent Reaction of NO and $O_3$

General Information:

The analyzer utilizes a chemiluminescent reaction between nitric oxide and ozone to quantitatively determine the concentration of nitrogen oxides in the sample air. Ozone, produced in excess by ultraviolet irradiation of dried air, is reacted with any nitric oxide in the sample air and the resultant chemiluminescent photons are measured with a photomultiplier proportional to the amount of nitric oxide in the sample. A second portion of sample air is routed through a converter which changes all the $NO_2$ in the sample air to nitric oxide. This gas is reacted in another reaction chamber with the ozone and gives a measurement proportional to the total amount of nitrogen oxides in the sample. Thus, there are two parallel reaction chambers determining the nitric oxide concentration and the total nitrogen oxides concentration. These signals are electronically subtracted to give a nitrogen dioxide concentration.

Analyte: Ozone

Procedure: Ultraviolet Photometry

General Information:

This analyzer works on the principle of absorption of ultraviolet light in the 254nm band by ozone. The principle is similar to an ultraviolet spectrophotometer with a 71cm folded gas cell. A sample of ambient air, selectively scrubbed of ozone, is injected into the cell. The attenuation of ultraviolet light without ozone is determined by a light sensitive diode. The sample cell is flushed and a new sample of air containing ambient levels of ozone is measured for ultraviolet absorption. The sample air without ozone is a reference cell measurement. The difference between the reference measurement and the sample with ozone measurement determines the ultraviolet absorption attributable only to the ozone. This absorption is proportional to the ozone concentration by the Beer-Lambert laws. Since only a single detection cell is used in the instrument, ambient air and ozone-scrubbed ambient air are sequentially cycled through the cell. This cycle time is between 20 and 30 seconds. This means that the anlayzer will not give correct values in situations in which the ozone concentration changes significantly in 30 seconds. This usually does not present a problem in enforcement monitoring but may be significant in low level research near point sources.

Analyte: Fluoride

Procedures: Dual Paper Tape Collection of HF and Particulates

General Information:

Sample air is drawn through the inlet tube and down through two paper tapes. The first tape is treated with citric acid and functions as a collector for particulates. The citric acid prevents the first tape from reacting with and absorbing gaseous hydrogen fluoride. The second tape is treated with sodium hydroxide and recovers better than 95 percent of the hydrogen fluoride at sampling times of 15 to 120 minutes with fluoride loads up to 40 ug/m$^3$. The sample air is drawn through a soda lime scrubber which removes the fluorides. The scrubbed air is used to pressurize the cabinet containing the sample tape rolls, thus preventing unwanted fluoride contamination of the tape by the intrument's operating environment. At preprogrammed time intervals the sampler shuts off the sample pump, indexes the tape and then samples a new section of tape. Approximately 600 samples can be collected on each tape set. The sample spots are cut out of the tape and subjected to one of the standard acceptable methods of fluoride analysis.

Analyte: Gaseous and Particulate Fluorides

Procedure: Bicarbonate Tube

General Information:

Sample air is drawn through a glass tube which has sodium bicarbonate coated on the inner wall of the tube. The bicarbonate removes gaseous fluorides from the sample stream. A filter at the end of the tube captures the particulates from the sample. After the normal sampling interval (usually 24 hours), the sample flow is stopped. The filter is retained for analysis of particulate fluorides. The bicarbonate is washed out of the tube and analyzed for fluoride content. Recovery of gaseous HF is about 95% up until saturation of the tube at 500 ug F. Sample air which is high in acids ($SO_2$, $NO_2$, $O_3$ and hydrocarbons, at 50% or greater relative humidity) will react with the bicarbonate in the tube and reduce collection efficiency and total fluoride holding capacity. The lower detectable limit of the method is a function of the quality of the bicarbonate used for coating the tubes. Bicarbonate containing significant fluoride contamination will not have the low level resolution of fluoride free bicarbonate. The minimum detectable limit is determined as two standard deviations of the mean of the blank values. The blanks come from sample tubes which have been prepared for sampling but are maintained unexposed.

Analyte: Foliar Fluorides

Procedure: Colorimetric Method

General Information:

Forage samples are collected from pre-selected areas twice per month. Such areas must be growing hay or silage or being grazed by livestock when the samples are collected. Each sample consists of a composite of at least 25 clippings collected in a predetermined geometric pattern over the area. The entire aerial portion of the plant over 3 cm above the ground is collected.

The samples are collected and stored in Kraft bags under carefully regulated temperatures awaiting laboratory analysis. In the laboratory the samples are air dried at 80° C for 24-48 hours. The samples are then milled to pass a 40 mesh sieve. The milled samples are dissolved in solution, distilled, buffered and analyzed with a colorimeter or by the specific ion electrode procedure.

Analyte: Visibility

Procedure: Integrating Nephelometer

General Information:

The visibility is determined by the measurement of the atmospheric extinction coefficient due to light scattering by both gases and aerosols in the air. The quantitative output can be displayed in units of scattering coefficient, meteorological range, or mass concentration of particulates. The air is drawn into a one-meter long tube where light is flashed across the air stream at right angles to the photodetector. Any light scattered due to particulates will be detected and recorded on a strip chart recorder.

Analyte: Metals

Procedure: ICP or ICAP

General Information:

Samples are nebulized and the aerosol that is produced is transported to the plasma torch where excitation occurs. Characteristic atomic-line emission spectra are produced by a radio-frequency inductively coupled plasma (ICP). The spectra are dispersed by a grating spectrometer and the intensities of the lines are monitored by photomultiplier tubes. The photocurrents from the photomultiplier tubes are processed and controlled by a computer system. A background correction technique is required to compensate for variable background contribution to the determination of trace elements. Background must be measured adjacent to analyte lines on samples during analysis. The position selected for the background intensity measurement, on either or both sides of the analytical line, will be determined by the complexity of the spectrum adjacent to the analyte line. The position used must be free of spectral interference and reflect the same change in background intensity as occurs at the analyte wavelength measured. Background correction is not required in cases of line broadening where a background correction measurement would actually degrade the analytical result.

## CONVERSION FACTORS

$SO_2$ 1 PPM = 2,620 UG/$M^3$

$H_2S$ 1 PPM = 1,400 UG/$M^3$

$NO_2$ 1 PPM = 1,330 UG/$M^3$

NO 1 PPM = 1,227 UG/$M^3$

$O_3$ 1 PPM = 1,960 UG/$M^3$

CO 1 PPM = 1,150 UG/$M^3$

# APPENDIX O

## Air Quality Data Processing Information

# APPENDIX O

## AIR QUALITY DATA PROCESSING INFORMATION

Agencies and companies often need to submit their air monitoring data to the state's computer system (AQDHS). This appendix is a brief summary of the various data forms and magnetic tape requirements for submitting data.

Figures AP-1-0 through AP-4-0 show four keypunch forms used for hourly, daily, and monthly data. Forms 2179 and BAC are used for daily (24-hour) data while form BAQ is generally used for monthly data. The SAROAD form is used only for hourly data. Brief instructions for forms 2179 and SAROAD follow the figures. Some parameter codes are listed.

Agencies and companies may submit their data on magnetic tapes. The data must be of the same format as the before-mentioned keypunch forms. Tape requirements are as follows:

Standard IBM label (if labeled)
Prefer Non-labeled (NL)
9-track tape
800, 1600, 6250 BPI's (specified)
80 characters
Any blocking size (specified)
EBCDIC
SAROAD on one file only
BAC, BAQ, 2179 one file only

STATE OF MONTANA
DEPARTMENT OF HEALTH AND ENVIRONMENTAL SCIENCES
AIR QUALITY BUREAU

Date Received: ______________________

Analyst: ______________________

Date Completed: ______________________

| | 2 | 7 |
|---|---|---|
| 1 | 2 | 3 |

HV Mem. Dichot.

Parameter
23 24 25 26 27

Method Units DP
28 29 30 31 32

Parameter
37 38 39 40 41

Method Units DP
42 43 44 45 46

Parameter
51 52 53 54 55

Method Units DP
56 57 58 59 60

Parameter
65 66 67 68 69

Method Units DP
70 71 72 73 74

Area Site Agn Pro T Year Month Day St. Hr.
4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 33 34 35 36 47 48 49 50 61 62 63 64 75 76 77 78 79 80

Figure AP-1-0

DATA INPUT FORM - 2179

Form: 2179 Comments:

MONTANA STATE DEPARTMENT OF HEALTH
AND ENVIRONMENTAL SCIENCES
Helena, Montana

| State | Agency | Project | Time | Year | Period (month) | Number of Spls. | Comp Type | Spl. Time |
|---|---|---|---|---|---|---|---|---|
| 2 3 | 11 | 12 13 | 14 | 15 16 | 17 18 | 19 20 | 21 | 22 |

2

Area Address

Collected By

Date Received Date Reported

Analyst

Comments or unusual activities:

| Name PARAMETER Code | Name PARAMETER Code | Name PARAMETER Code | Name PARAMETER Code |
|---|---|---|---|
| 23 24 25 26 27 | 37 38 39 40 41 | 51 52 53 54 55 | 65 66 67 68 69 |
| Method Units DP | Method Units DP | Method Units DP | Method Units DP |
| 28 29 30 31 32 | 42 43 44 45 46 | 56 57 58 59 60 | 70 71 72 73 74 |

| Lab. No. | Sample No. | Location and Description | Date Out | Date In | Sampling Period | Area 4 | 5 | 6 | 7 | Site 8 | 9 | 10 | 33 | 34 | 35 | 36 | 47 | 48 | 49 | 50 | 61 | 62 | 63 | 64 | 75 | 76 | 77 | 78 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
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| | | | | | | | | | | | | 4 | 3 | 2 | 1 0 | 4 | 3 | 2 | 1 0 | 4 | 3 | 2 | 1 0 | 4 | 3 | 2 | 1 0 |

Figure AP-2-0

DATA INPUT FORM - BAC

BAC 3-72

STATE DEPARTMENT OF HEALTH

AND ENVIRONMENTAL SCIENCES

HELENA, MONTANA

24-HOUR OR GREATER SAMPLING INTERVAL

2
1 Agency ______

City Name ______

Site Address ______

Project ______ Time Interval

State ☐☐ Area ☐☐☐☐ Site ☐☐☐
2 3 4 5 6 7 8 9 10

Agency ☐ Pro. ☐ T. ☐ Year ☐☐ Month ☐☐
11 12 13 14 15 16 17 18

| TSP | Org | As | Pb |
|---|---|---|---|
| Name PARAMETER Code | Name PARAMETER Code | Name PARAMETER Code | Name PARAMETER Code |
| ☐☐☐☐☐<br>23 24 25 26 27 | ☐☐☐☐☐<br>37 38 39 40 41 | ☐☐☐☐☐<br>51 52 53 54 55 | ☐☐☐☐☐<br>65 66 67 68 69 |
| Method Units DP<br>☐☐☐☐☐<br>28 29 30 31 32 | Method Units DP<br>☐☐☐☐☐<br>42 43 44 45 46 | Method Units DP<br>☐☐☐☐☐<br>56 57 58 59 60 | Method Units DP<br>☐☐☐☐☐<br>70 71 72 73 74 |

| Collection Day 19 20 | Lab. No. | Filter No. | Date Sample Logged | Operator | Total Volume Air (M3) | Unusual Circumstance * | Day 19 20 | 21 22 | 33 34 35 36 | 47 48 49 50 | 61 62 63 64 | 75 76 77 78 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 1 | | | | | | | 0 1 | | | | | |
| 0 2 | | | | | | | 0 2 | | | | | |
| 0 3 | | | | | | | 0 3 | | | | | |
| 0 4 | | | | | | | 0 4 | | | | | |
| 0 5 | | | | | | | 0 5 | | | | | |
| 0 6 | | | | | | | 0 6 | | | | | |
| 0 7 | | | | | | | 0 7 | | | | | |
| 0 8 | | | | | | | 0 8 | | | | | |
| 0 9 | | | | | | | 0 9 | | | | | |
| 1 0 | | | | | | | 1 0 | | | | | |
| 1 1 | | | | | | | 1 1 | | | | | |
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| 1 7 | | | | | | | 1 7 | | | | | |
| 1 8 | | | | | | | 1 8 | | | | | |
| 1 9 | | | | | | | 1 9 | | | | | |
| 2 0 | | | | | | | 2 0 | | | | | |
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| 2 4 | | | | | | | 2 4 | | | | | |
| 2 5 | | | | | | | 2 5 | | | | | |
| 2 6 | | | | | | | 2 6 | | | | | |
| 2 7 | | | | | | | 2 7 | | | | | |
| 2 8 | | | | | | | 2 8 | | | | | |
| 2 9 | | | | | | | 2 9 | | | | | |
| 3 0 | | | | | | | 3 0 | | | | | |
| 3 1 | | | | | | | 3 1 | | | | | |
| | | | | | | | DP → | | 4 3 2 1 0 | 4 3 2 1 0 | 4 3 2 1 0 | 4 3 2 1 0 |

| Cd | Zn | SO4* | |
|---|---|---|---|
| Name PARAMETER Code | Name PARAMETER Code | Name PARAMETER Code | Name PARAMETER Code |
| ☐☐☐☐☐<br>23 24 25 26 27 | ☐☐☐☐☐<br>37 38 39 40 41 | ☐☐☐☐☐<br>51 52 53 54 55 | ☐☐☐☐☐<br>65 66 67 68 69 |
| Method Units DP<br>☐☐☐☐☐<br>28 29 30 31 32 | Method Units DP<br>☐☐☐☐☐<br>42 43 44 45 46 | Method Units DP<br>☐☐☐☐☐<br>56 57 58 59 60 | Method Units DP<br>☐☐☐☐☐<br>70 71 72 73 74 |

| Day 19 20 | 33 34 35 36 | 47 48 49 50 | 61 62 63 64 | 75 76 77 78 |
|---|---|---|---|---|
| 0 1 | | | | |
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| 2 5 | | | | |
| 2 6 | | | | |
| 2 7 | | | | |
| 2 8 | | | | |
| 2 9 | | | | |
| 3 0 | | | | |
| 3 1 | | | | |
| | 4 3 2 1 0 | 4 3 2 1 0 | 4 3 2 1 0 | 4 3 2 1 0 |

Comments or unusual circumstances

| * codes | |
|---|---|
| 0 = excess of 24 hr. | 5 = dry |
| 1 = approx. 72°F | 6 = clear |
| 2 = approx. 32°F | 7 = hazy |
| 3 = rain | 8 = calm |
| 4 = snow | 9 = windy |

BAQ
3/72

Figure AP-3-0

DATA INPUT FORM - BAQ

LESS THAN 24-HOUR SAMPLING INTERVAL

AIR QUALITY BUREAU

| State | | Area | | | | Site | | |
|---|---|---|---|---|---|---|---|---|
| 2 | 7 | | | | | | | |
| 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |

☐ 1 ______________ Agency

______________ City Name

______________ Site Address

______________ Project

______________ Parameter observed

______________ Method

______________ Time interval of obs.

______________ Units of obs.

| Agency | Project | | Time | Year | | Month | |
|---|---|---|---|---|---|---|---|
| | | | | | | | |
| 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 |

| Parameter code | | | | | Method | | Units | | DP |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | |
| 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 | 31 | 32 |

| Day | St Hr | Rdg 1 | Rdg 2 | Rdg 3 | Rdg 4 | Rdg 5 | Rdg 6 | Rdg 7 | Rdg 8 | Rdg 9 | Rdg 10 | Rdg 11 | Rdg 12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 19 20 | 21 22 | 33 34 35 36 | 37 38 39 40 | 41 42 43 44 | 45 46 47 48 | 49 50 51 52 | 53 54 55 56 | 57 58 59 60 | 61 62 63 64 | 65 66 67 68 | 69 70 71 72 | 73 74 75 76 | 77 78 79 80 |
| 01 | 00 | | | | | | | | | | | | |
| 01 | 12 | | | | | | | | | | | | |
| 02 | 00 | | | | | | | | | | | | |
| 02 | 12 | | | | | | | | | | | | |
| 03 | 00 | | | | | | | | | | | | |
| 03 | 12 | | | | | | | | | | | | |
| 04 | 00 | | | | | | | | | | | | |
| 04 | 12 | | | | | | | | | | | | |
| 05 | 00 | | | | | | | | | | | | |
| 05 | 12 | | | | | | | | | | | | |
| 06 | 00 | | | | | | | | | | | | |
| 06 | 12 | | | | | | | | | | | | |
| 07 | 00 | | | | | | | | | | | | |
| 07 | 12 | | | | | | | | | | | | |
| 08 | 00 | | | | | | | | | | | | |
| 08 | 12 | | | | | | | | | | | | |
| 09 | 00 | | | | | | | | | | | | |
| 09 | 2 | | | | | | | | | | | | |
| 10 | 00 | | | | | | | | | | | | |
| 10 | 12 | | | | | | | | | | | | |
| 11 | 00 | | | | | | | | | | | | |
| 11 | 12 | | | | | | | | | | | | |
| 12 | 00 | | | | | | | | | | | | |
| 12 | 12 | | | | | | | | | | | | |
| 13 | 00 | | | | | | | | | | | | |
| 13 | 12 | | | | | | | | | | | | |
| 14 | 00 | | | | | | | | | | | | |
| 14 | 12 | | | | | | | | | | | | |
| 15 | 00 | | | | | | | | | | | | |
| 15 | 12 | | | | | | | | | | | | |
| 16 | 00 | | | | | | | | | | | | |

Figure AP-4-0

DATA INPUT FORM - SAROAD

## FORM 2179

| | |
|---|---|
| Col 1 | Will always be coded 2, which indicates a 24-hour sample |
| Col 4-10 | Area and site codes (different for each site, supplied by AQB) |
| Col 11 | Agency code = J (indicates company, other letters indicate agencies) |
| Col 12, 13 | Project code = 02 (or 07 is sampler is co-located) |
| Col 14 | Time code = 8 |
| Col 15-20 | Year, month, day the sample was run (YY, MM, DD) |
| Col 21, 22 | Start hour = 00 (for all TSP readings) |
| Col 23-27 | Parameter code = 11101 for TSP |
| Col 28, 29 | Method code = 91 for TSP |
| Col 30, 31 | Unit code = 01 for TSP |
| Col 32 | Decimal code = 0 or 1 depending on analysis - but be consistent |
| Col 33-36 | Data |
| Col 37-46 | Additional parameters |
| Col 47-50 | Space for data for parameter in Col 37-46, and so on |
| Col 79 | Blank |
| Col 80 | Always coded 2 to indicate new data |

## SAROAD FORMS

These forms are numbered according to the days of the month. They are filled out similarly to 2179 with these exceptions:

| | |
|---|---|
| Col 14 | Time code = 1 for hourly data |
| Col 23-32 | Parameter, method, unit, decimal depending on monitoring equipment. See Parameter Code Description Table. |
| Col 33-80 | Data (for negative numbers, contact AQB for correct procedure) |

## PARAMETER CODE DESCRIPTION TABLE

| Parameter | Code | Method | Units | Decimal | Method Description |
|---|---|---|---|---|---|
| TSP | 11101 | 91 | 01 | 0 | Gravimetric - ug/m$^3$ |
| Lead | 12128 | 90 | 01 | 2 | ICAP - ug/m$^3$ |
| Carbon Monoxide | 42101 | 11 | 07 | 1 | NonDispersive IR - ppm |
| Sulfur Dioxide | 42401 | 20 | 07 | 3 | Pulsed Fluorescent - ppm |
| Wind Speed | 61101 | 50 | 11 | 1 | Electronic Avg - meters/sec |
| | 61101 | 40 | 12 | 1 | Visual Avg - miles/hour |
| Wind Direction | 61102 | 50 | 14 | 0 | Electronic Avg - degrees |
| | 61102 | 40 | 14 | 0 | Visual Avg - degrees |
| Wind Deviation | 61106 | 50 | 14 | 0 | Electronic Avg - degrees |
| Temperature | 62101 | 50 | 17 | 1 | Electronic Avg - °Centrigrade |
| | 62101 | 40 | 15 | 1 | Machine Avg - °Fahrenheit |

Additional parameter codes are available from the Air Quality Bureau.

# APPENDIX P

## Acronyms and Abbreviations

# APPENDIX P

## ACRONYMS AND ABBREVIATIONS

| | |
|---|---|
| AA | Atomic absorption spectrophotometry |
| ACFM | Actual cubic feet per minute |
| ADP | Automatic data processing |
| AIRS | Aerometric Information Retrieval System |
| APCA | Air Pollution Control Association |
| APRAC | Urban diffusion model for CO |
| AQB | Air Quality Bureau |
| AQCR | Air Quality Control Region |
| AQDHS | Air Quality Data Handling System |
| AQDM | Air Quality Display Model |
| AQMA | Air Quality Maintenance Area |
| ARM | Administrative Rules of Montana |
| As | Arsenic |
| ASTM | American Society for Testing Materials |
| BACT | Best Available Control Technology |
| B(a)P | Benzo-(a)-pyrene |
| CAA | Clean Air Act |
| CAAA | Clean Air Act Amendments |
| CALINE | California Line Model for CO |
| Cd | Cadmium |
| CDHS | Comprehensive Data Handling System |
| CDM | Climatological Dispersion Model |
| CEMS | Continuous emission monitoring system |
| CFR | Code of Federal Regulations |
| CO | Carbon monoxide |
| $CO_2$ | Carbon dioxide |
| CRM | Certified Reference Material |
| CRSTER | Single source meteorological model |
| Cu | Copper |
| DAS | Data aquisition system |
| DHES | Department of Health & Environmental Sciences |
| DHS | Data handling system |
| DNRC | Department of Natural Resources and Conservation |
| DSCF | Dry standard cubic feet |
| DSL | Department of State Lands |
| EA | Environmental assessment |
| EIC | Environmental Information Center |
| EIS | Environmental Impact Statement |
| EIS/P&R | Emission Inventory System/Permits and Registration |
| EPA | United States Environmental Protection Agency |
| EQC | Environmental Quality Council |
| ESD | Environmental Sciences Division |
| ESP | Electrostatic precipitator |
| ES&T | Environmental Science and Technology |

| | |
|---|---|
| F | Fluorine (fluoride) |
| FAA | Federal Aviation Administration |
| FBC | Fluidized bed combustion |
| FGD | Flue gas desulfurization |
| FID | Flame ionization detector |
| FPD | Flame photometric detector |
| G or (g) | Grams |
| GC | Gas chromatography |
| GR or (gr) | Grains |
| HC | Hydrocarbons |
| HF | Hydrofluoric acid |
| HIWAY | Meteorological model for CO |
| HPLC | High performance liquid chromatography |
| $H_2O$ | Water |
| $H_2S$ | Hydrogen sulfide |
| $H_2SO_4$ | Sulfuric acid |
| ICP/ICAP | Inductively Coupled Plasma; Inductive Coupled Argon Plasma |
| I/M | Inspection and maintenance |
| IP | Inhalable particulates |
| ISC | Industrial Source Complex model |
| JAPCA | Journal of Air Pollution Control Association |
| LAER | Lowest Achieveable Emission Rate |
| M | Meter |
| $M^3$ | Cubic meters |
| MAAQS | Montana Ambient Air Quality Standards Study |
| MAPS | Montana Air Pollution Study |
| MCA | Montana Codes Annotated |
| MCAA | Montana Clean Air Act |
| MEPA | Montana Environmental Policy Act |
| MHD | Magnetohydrodynamics |
| MS | Mass spectrometry |
| MCCHD | Missoula City-County Health Department |
| MO | Montana Office (EPA) |
| Mu | Micron |
| NA | Neutron activation or nonattainment |
| NAAQS | National Ambient Air quality Standards |
| NADB | National Aerometric Data Bank |
| NADP | National Atmospheric Deposition Program |
| NAMS | National Air Monitoring Station |
| NBS | National Bureau of Standards |
| NDIR | Nondispersive infrared analysis |
| NEDS | National Emission Data System |
| NEPA | National Environmental Policy Act |
| NESHAPS | National Emission Standards for Hazardous Air Pollutants |

| | |
|---|---|
| Ni | Nickel |
| NMHC | Non methane hydrocarbons |
| NMR | Nuclear magnetic resonance |
| NOAA | National Oceanic and Atmospheric Administration |
| NOx | Oxides of nitrogen |
| $NO_2$ | Nitrogen dioxide |
| $NO_3$ | Nitrate |
| NPRC | Northern Plains Resource Council |
| NSPS | New Source Performance Standards |
| NTIS | National Technical Information Service |
| NWS | National Weather Sevice |
| O | Oxygen atom |
| $O_2$ | Oxygen molecule |
| $O_3$ | Ozone |
| PAL | Point, Area and Line Source air quality model |
| Pb | Lead |
| PBL | Planetary boundary layer |
| PER | Preliminary Environmental Review |
| PM | Preventive maintenance |
| PM10 | Particulate matter less than 10 microns in diameter |
| PNA | Polynuclear aromatic hydrocarbon |
| POM | Polycyclic organic matter |
| PPM | Parts per million |
| PSD | Prevention of Significant Deterioration |
| PSI | Pollutant Standards Index or pounds per square inch |
| PTDIS | Single stack meteorological model |
| PTMAX | Single stack meteorological model |
| PTMTP | Multistack meteorological model |
| P&A | Precision and accuracy |
| QA | Quality assurance |
| RACT | Reasonably Available Control Technology |
| RAM | Urban Air Model for point and area sources |
| RP | Respirable particulates |
| S | Sulfur |
| SAMWG | Standing Air Monitoring Work Group |
| SAROAD | Storage and Retrieval of Aerometric Data |
| SI | International system of units |
| SIP | State Implementation Plan |
| SLAMS | State and Local Air Monitoring Station |
| $SO_2$ | Sulfur dioxide |
| $SO_4$ | Sulfate |
| SPM | Special Purpose Monitoring Station |
| SPSS | Statistical Package for the Social Sciences |
| SRM | Standard Reference Materials |
| SWMB | Solid Waste Management Bureau |

| | |
|---|---|
| TCM | Texas Climatological Model |
| THC | Total hydrocarbons |
| TLV | Threshold limit value |
| TRS | Total reduced sulfur |
| TSP | Total suspended particulate matter |
| $UG/M^3$ (or $ug/m^3$) | Micrograms per cubic meter |
| UNAMAP | User's Network for Applied Modeling of Air Pollution |
| USEPA | United States Environmental Protection Agency |
| V | Vanadium |
| VALLEY | Meteorological model for concentrations on elevated terrain |
| WQB | Water Quality Bureau |
| XRF | X-ray fluorescence |
| YCAPC | Yellowstone County Air Pollution Control |
| Zn | Zinc |

# APPENDIX Q

## AQCR's and Area Codes

# APPENDIX Q

## AQCR'S AND AREA CODES

As per the Clean Air Act, the Administrator for the EPA divided the State into geographic areas or air quality control regions (AQCR). These are as follows:

| AQCR | Name |
|---|---|
| 140 | Billings |
| 141 | Great Falls |
| 142 | Helena |
| 143 | Miles City |
| 144 | Missoula |

Figure AP-1-Q shows the boundaries of Montana's five AQCR's on a map of the state.

Area codes for Montana are listed on Table AP-Q-I.

AQCR's and area codes are used by data users for requesting or processing data.

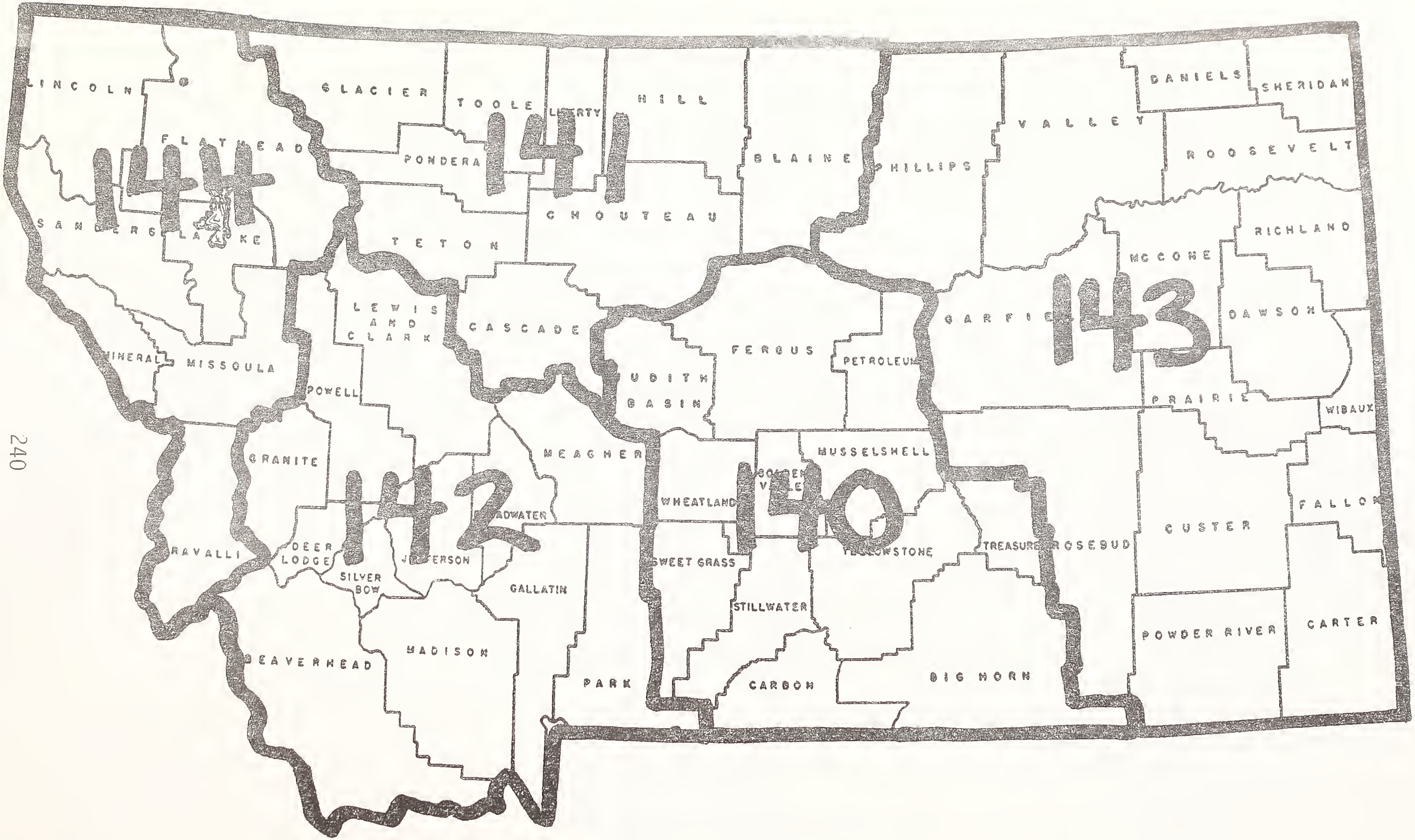
144
141
142
140
143
LINCOLN
FLATHEAD
SANDERS
LAKE
GLACIER
TOOLE
LIBERTY
HILL
BLAINE
PHILLIPS
VALLEY
DANIELS
SHERIDAN
ROOSEVELT
PONDERA
CHOUTEAU
TETON
RICHLAND
MC CONE
DAWSON
GARFIELD
LEWIS AND CLARK
CASCADE
FERGUS
PETROLEUM
MINERAL
MISSOULA
POWELL
JUDITH BASIN
PRAIRIE
WIBAUX
GRANITE
MEAGHER
MUSSELSHELL
GOLDEN VALLEY
WHEATLAND
BROADWATER
FALLON
CUSTER
RAVALLI
DEER LODGE
JEFFERSON
SILVER BOW
SWEET GRASS
YELLOWSTONE
TREASURE
ROSEBUD
GALLATIN
STILLWATER
POWDER RIVER
CARTER
MADISON
BEAVERHEAD
PARK
CARBON
BIG HORN

Figure AP-1-Q

MONTANA AIR QUALITY CONTROL REGIONS

## Table AP-Q-I

## MONTANA AREA CODES

| | |
|---|---|
| 0020 | ANACONDA |
| 0030 | BAKER |
| 0040 | *BEAVERHEAD |
| 0060 | *BIG HORN |
| 0080 | BILLINGS |
| 0100 | *BLAINE |
| 0120 | BOZEMAN |
| 0140 | *BROADWATER |
| 0160 | BUTTE |
| 0180 | *CARBON |
| 0200 | *CARTER |
| 0220 | *CASCADE |
| 0240 | CENTERVILLE DUBLIN GULCH |
| 0260 | *CHOUTEAU |
| 0270 | COLUMBIA FALLS |
| 0280 | CONRAD |
| 0300 | *CUSTER |
| 0320 | CUT BANK |
| 0340 | *DANIELS |
| 0360 | *DAWSON |
| 0380 | DEER LODGE |
| 0400 | *DEER LODGE |
| 0420 | DILLON |
| 0440 | *FALLON |
| 0460 | *FERGUS |
| 0480 | *FLAT HEAD |
| 0500 | FLORAL PARK |
| 0520 | *GALLATIN |
| 0540 | *GARFIELD |
| 0560 | *GLACIER |
| 0570 | GLACIER NAT PARK |
| 0580 | GLASGOW |
| 0600 | GLENDIVE |
| 0620 | *GOLDEN VALLEY |
| 0640 | *GRANITE |
| 0660 | GREAT FALLS |
| 0670 | HAMILTON |
| 0680 | HARDIN |
| 0700 | HAVRE |
| 0720 | HELENA |
| 0740 | *HILL |
| 0760 | *JEFFERSON |
| 0780 | *JUDITH BASIN |
| 0800 | KALISPELL |
| 0820 | *LAKE |
| 0840 | LAUREL |
| 0860 | *LEWIS AND CLARK |
| 0880 | LEWISTOWN |
| 0900 | LIBBY |
| 0920 | *LIBERTY |
| 0940 | *LINCOLN |
| 0960 | LIVINGSTON |
| 0980 | *MC CONE |
| 1000 | *MADISON |
| 1010 | MALMSTROM |
| 1020 | *MEAGHER |
| 1040 | MILES CITY |
| 1060 | *MINERAL |
| 1080 | MISSOULA |
| 1085 | MISSOULA SOUTH |
| 1090 | MISSOULA WEST |
| 1100 | *MISSOULA |
| 1140 | *MUSSELSHELL |
| 1160 | *PARK |
| 1180 | *PETROLEUM |
| 1200 | *PHILLIPS |
| 1220 | *PONDERA |
| 1240 | *POWDER RIVER |
| 1260 | *POWELL |
| 1280 | *PRAIRIE |
| 1300 | *RAVALLI |
| 1320 | *RICHLAND |
| 1340 | *ROOSEVELT |
| 1360 | *ROSEBUD |
| 1380 | ROUNDUP |
| 1400 | *SANDERS |
| 1420 | SHELBY |
| 1440 | *SHERIDAN |
| 1460 | SIDNEY |
| 1480 | *SILVER BOW |
| 1500 | SILVER BOW PARK |
| 1520 | *STILLWATER |
| 1540 | *SWEET GRASS |
| 1560 | *TETON |
| 1580 | *TOOLE |
| 1600 | *TREASURE |
| 1620 | *VALLEY |
| 1640 | *WHEATLAND |
| 1660 | WHITEFISH |
| 1680 | *WIBAUX |
| 1700 | WOLF POINT |
| 1720 | *YELLOWSTONE |
| 1740 | YELLOWSTONE NAT PARK |

# INTERNATIONAL ATOMIC WEIGHTS 1961

BASED ON CARBON-12

| | Symbol | Atomic Number | Atomic Weight |
|---|---|---|---|
| Actinium | Ac | 89 | [227] * |
| Aluminum | Al | 13 | 26.9815 |
| Americium | Am | 95 | [243] * |
| Antimony | Sb | 51 | 121.75 |
| Argon | Ar | 18 | 39.948 |
| Arsenic | As | 33 | 74.9216 |
| Astatine | At | 85 | [210] * |
| Barium | Ba | 56 | 137.34 |
| Berkelium | Bk | 97 | [249] * |
| Beryllium | Be | 4 | 9.0122 |
| Bismuth | Bi | 83 | 208.980 |
| Boron | B | 5 | 10.811 [a] |
| Bromine | Br | 35 | 79.909 [b] |
| Cadmium | Cd | 48 | 112.40 |
| Calcium | Ca | 20 | 40.08 |
| Californium | Cf | 98 | [251] * |
| Carbon | C | 6 | 12.01115 [a] |
| Cerium | Ce | 58 | 140.12 |
| Cesium | Cs | 55 | 132.905 |
| Chlorine | Cl | 17 | 35.453 [b] |
| Chromium | Cr | 24 | 51.996 [b] |
| Cobalt | Co | 27 | 58.9332 |
| Copper | Cu | 29 | 63.54 |
| Curium | Cm | 96 | [247] * |
| Dysprosium | Dy | 66 | 162.50 |
| Einsteinium | Es | 99 | [254] * |
| Erbium | Er | 68 | 167.26 |
| Europium | Eu | 63 | 151.96 |
| Fermium | Fm | 100 | [253] * |
| Fluorine | F | 9 | 18.9984 |
| Francium | Fr | 87 | [223] * |
| Gadolinium | Gd | 64 | 157.25 |
| Gallium | Ga | 31 | 69.72 |
| Germanium | Ge | 32 | 72.59 |
| Gold | Au | 79 | 196.967 |
| Hafnium | Hf | 72 | 178.49 |
| Helium | He | 2 | 4.0026 |
| Holmium | Ho | 67 | 164.930 |
| Hydrogen | H | 1 | 1.00797 [a] |
| Indium | In | 49 | 114.82 |
| Iodine | I | 53 | 126.9044 |
| Iridium | Ir | 77 | 192.2 |
| Iron | Fe | 26 | 55.847 [b] |
| Krypton | Kr | 36 | 83.80 |
| Lanthanum | La | 57 | 138.91 |
| Lead | Pb | 82 | 207.19 |
| Lithium | Li | 3 | 6.939 |
| Lutetium | Lu | 71 | 174.97 |
| Magnesium | Mg | 12 | 24.312 |
| Manganese | Mn | 25 | 54.9380 |
| Mendelevium | Md | 101 | [256] * |
| Mercury | Hg | 80 | 200.59 |
| Molybdenum | Mo | 42 | 95.94 |
| Neodymium | Nd | 60 | 144.24 |
| Neon | Ne | 10 | 20.183 |
| Neptunium | Np | 93 | [237] * |
| Nickel | Ni | 28 | 58.71 |
| Niobium | Nb | 41 | 92.906 |
| Nitrogen | N | 7 | 14.0067 |
| Nobelium | No | 102 | [254] * |
| Osmium | Os | 76 | 190.2 |
| Oxygen | O | 8 | 15.9994 [a] |
| Palladium | Pd | 46 | 106.4 |
| Phosphorus | P | 15 | 30.9738 |
| Platinum | Pt | 78 | 195.09 |
| Plutonium | Pu | 94 | [242] * |
| Polonium | Po | 84 | [210] * |
| Potassium | K | 19 | 39.102 |
| Praseodymium | Pr | 59 | 140.907 |
| Promethium | Pm | 61 | [147] * |
| Protactinium | Pa | 91 | [231] * |
| Radium | Ra | 88 | [226] * |
| Radon | Rn | 86 | [222] * |
| Rhenium | Re | 75 | 186.2 |
| Rhodium | Rh | 45 | 102.905 |
| Rubidium | Rb | 37 | 85.47 |
| Ruthenium | Ru | 44 | 101.07 |
| Samarium | Sm | 62 | 150.35 |
| Scandium | Sc | 21 | 44.956 |
| Selenium | Se | 34 | 78.96 |
| Silicon | Si | 14 | 28.086 [a] |
| Silver | Ag | 47 | 107.870 [b] |
| Sodium | Na | 11 | 22.9898 |
| Strontium | Sr | 38 | 87.62 |
| Sulfur | S | 16 | 32.064 [a] |
| Tantalum | Ta | 73 | 180.948 |
| Technetium | Tc | 43 | [99] * |
| Tellurium | Te | 52 | 127.60 |
| Terbium | Tb | 65 | 158.924 |
| Thallium | Tl | 81 | 204.37 |
| Thorium | Th | 90 | 232.038 |
| Thulium | Tm | 69 | 168.934 |
| Tin | Sn | 50 | 118.69 |
| Titanium | Ti | 22 | 47.90 |
| Tungsten | W | 74 | 183.85 |
| Uranium | U | 92 | 238.03 |
| Vanadium | V | 23 | 50.942 |
| Xenon | Xe | 54 | 131.30 |
| Ytterbium | Yb | 70 | 173.04 |
| Yttrium | Y | 39 | 88.905 |
| Zinc | Zn | 30 | 65.37 |
| Zirconium | Zr | 40 | 91.22 |

200 copies of this public document were published at an estimated cost of $10.87 per copy, for a total cost of $2,175.00 which includes $1,950.00 for printing and $225.00 for distribution.